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(12) **United States Patent**
Kim et al.

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(54) **WASHING MACHINE**

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Oct. 20, 2009	(KR)	10-2009-0099900
Oct. 20, 2009	(KR)	10-2009-0099901

(51) **Int. Cl.**

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A47K 1/04	(2006.01)
A47B 88/00	(2006.01)

(52) **U.S. Cl.** **68/196**; 312/228; 312/328

(58) **Field of Classification Search** 312/228, 312/257.1, 327–329, 204, 138.1, 265.5; 34/603, 34/201; 68/196; 134/200; 16/415, 443; 220/212.5

See application file for complete search history.

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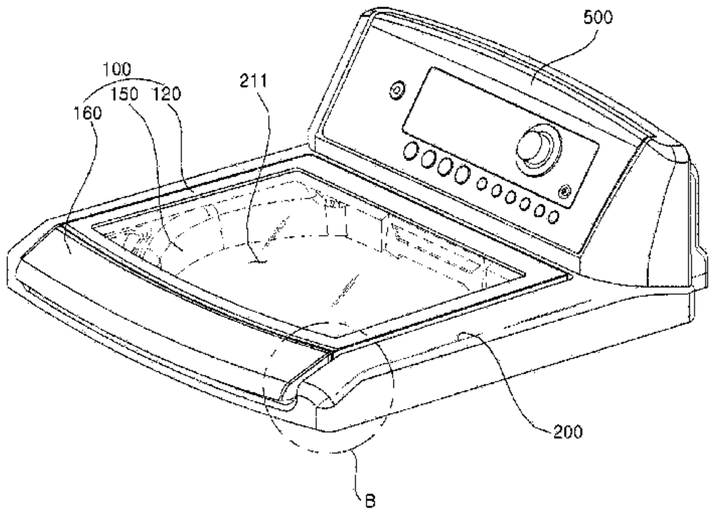
(57) **ABSTRACT**

A washing machine comprising a cabinet, a top cover arranged at an upper surface of the cabinet and has a laundry entrance hole, wherein the upper surface of the cabinet opens, and a lid assembly arranged at the top cover and opens/closes the laundry entrance hole is provided. A handle is provided at a front side of the lid assembly. The handle protrudes forwards more than the top cover, wherein the handle and the top cover are arranged to be spaced apart from each other in upper and lower directions and in front and rear directions, thereby defining spaces between the handle and the top cover so a user's hand is inserted into the spaces to hold the handle and lifts the lid assembly.

14 Claims, 21 Drawing Sheets



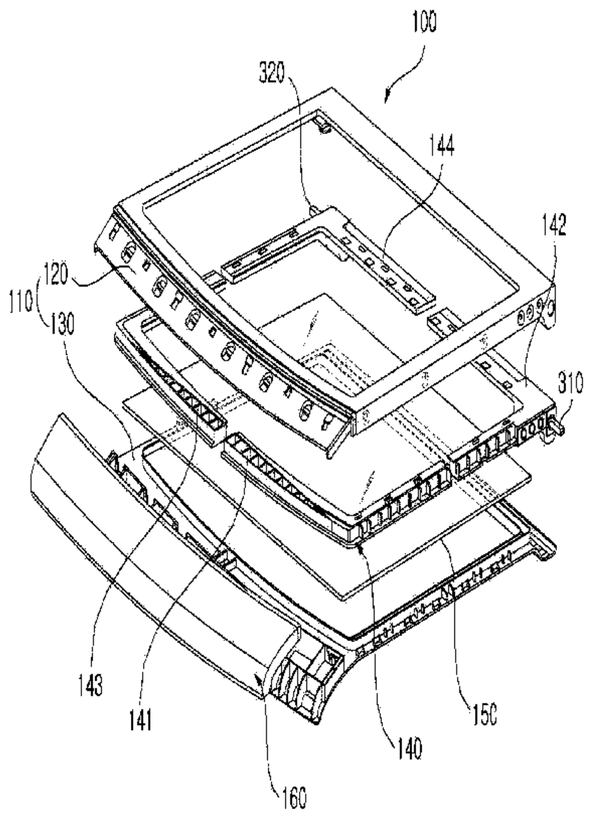


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FIG. 1

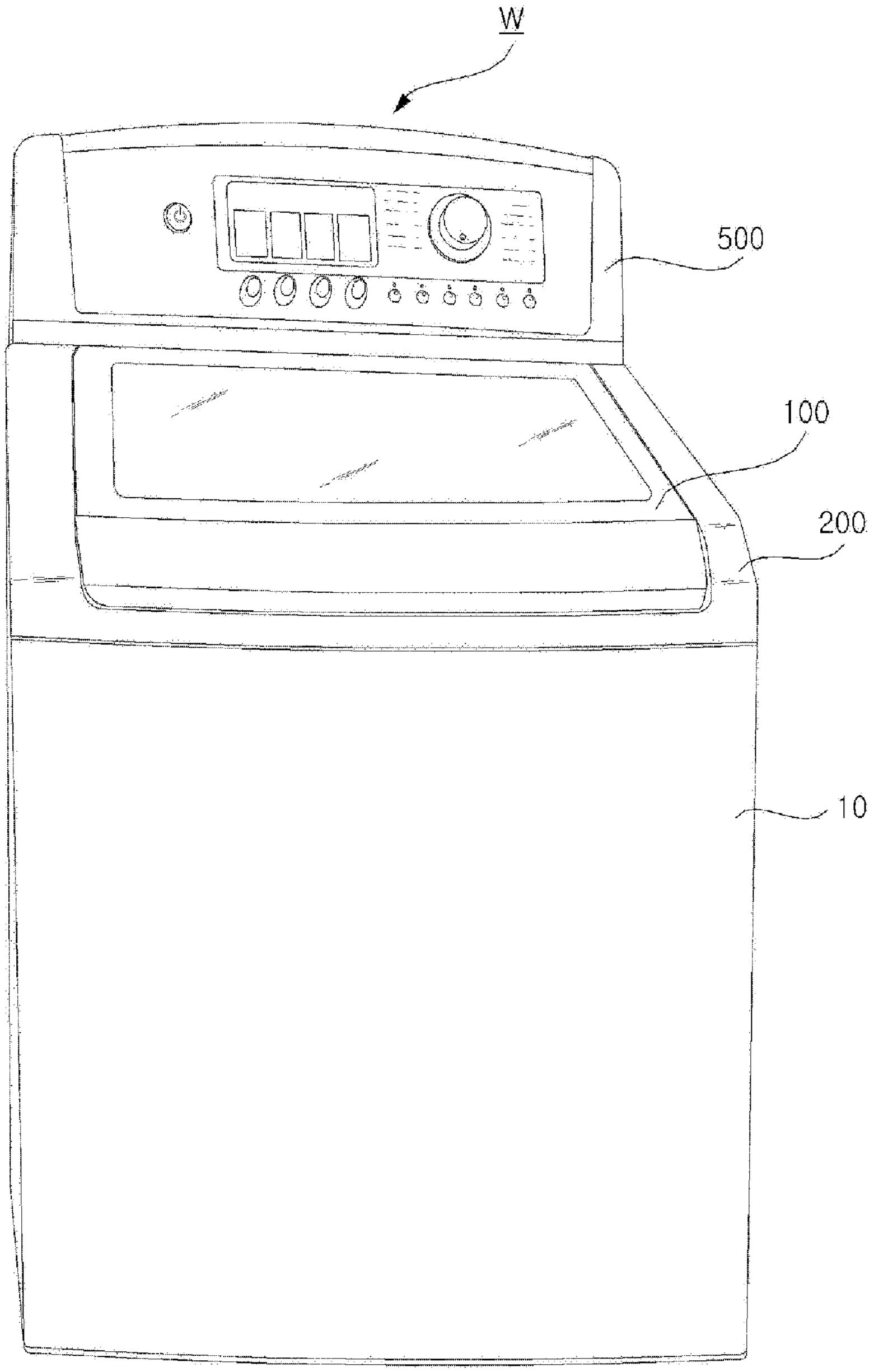


FIG. 2

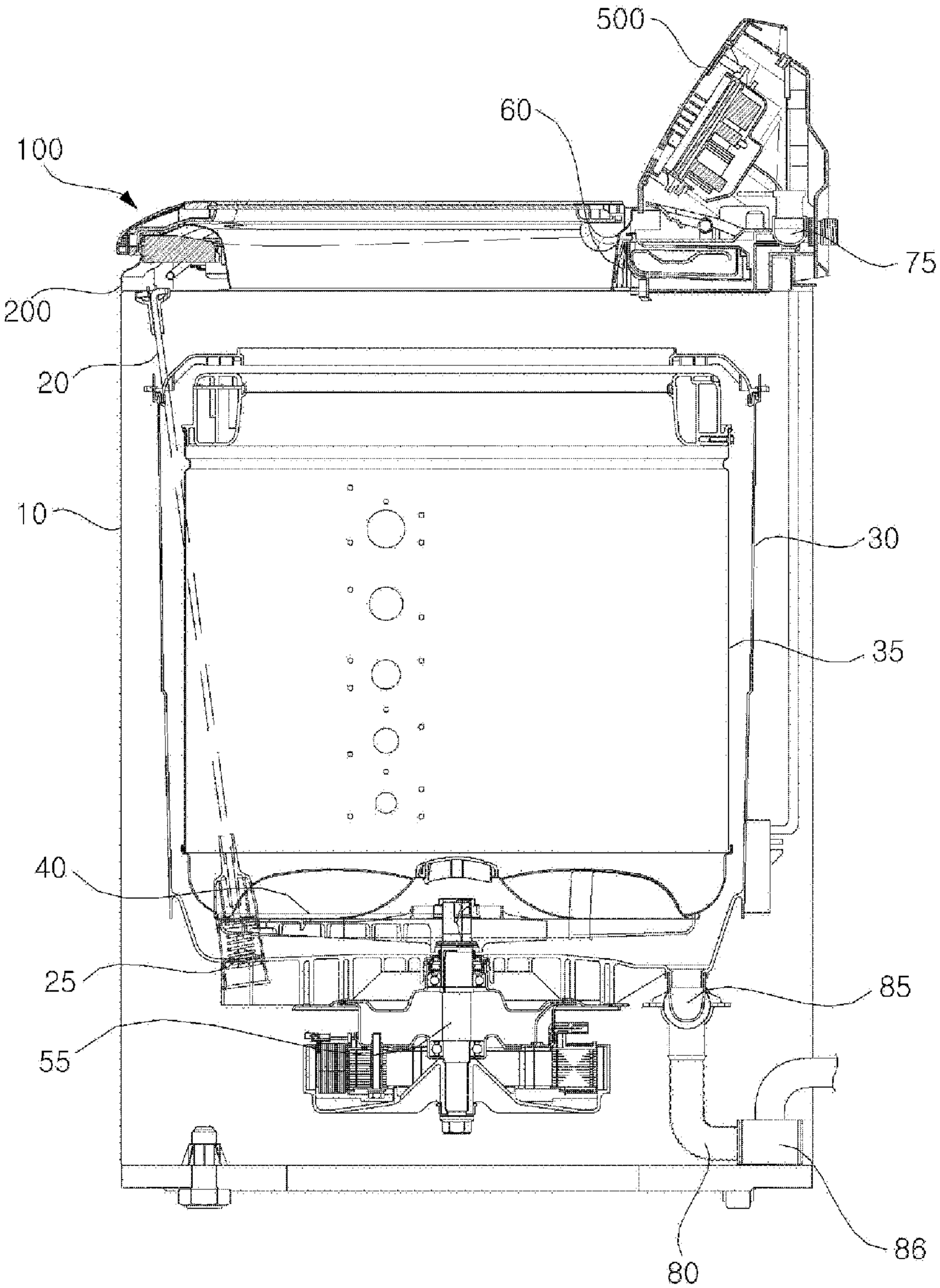


FIG. 3

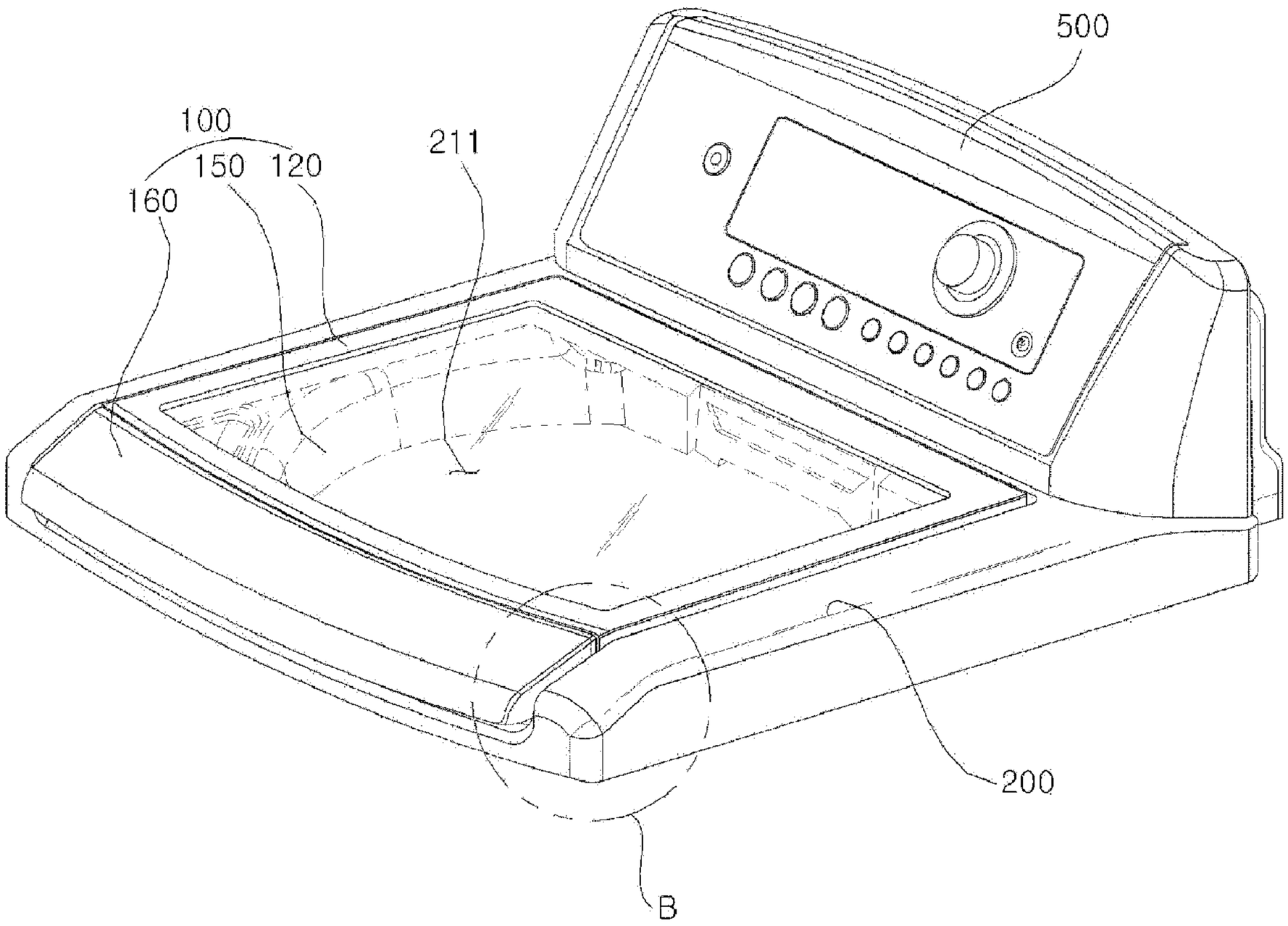


FIG. 4

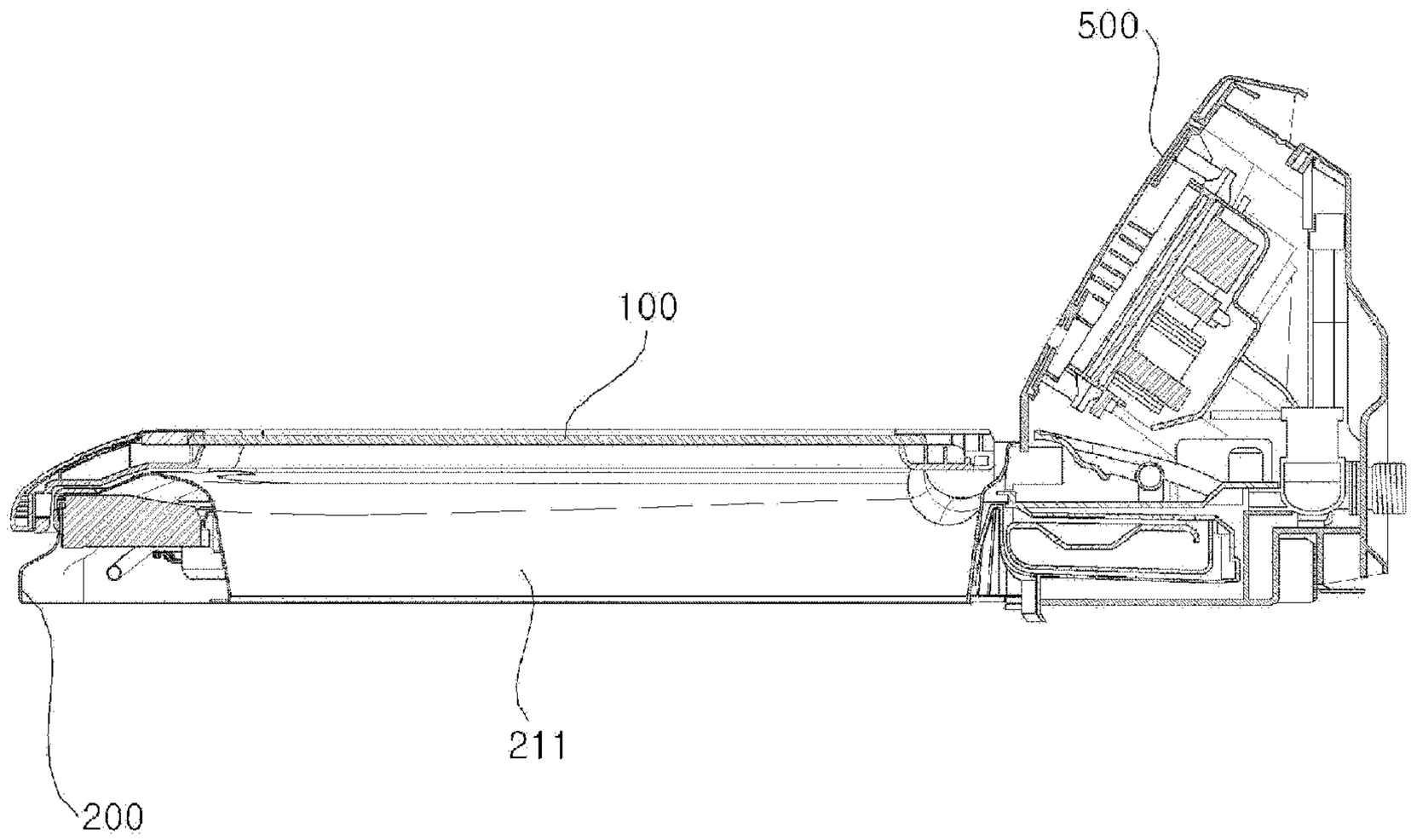


FIG. 5

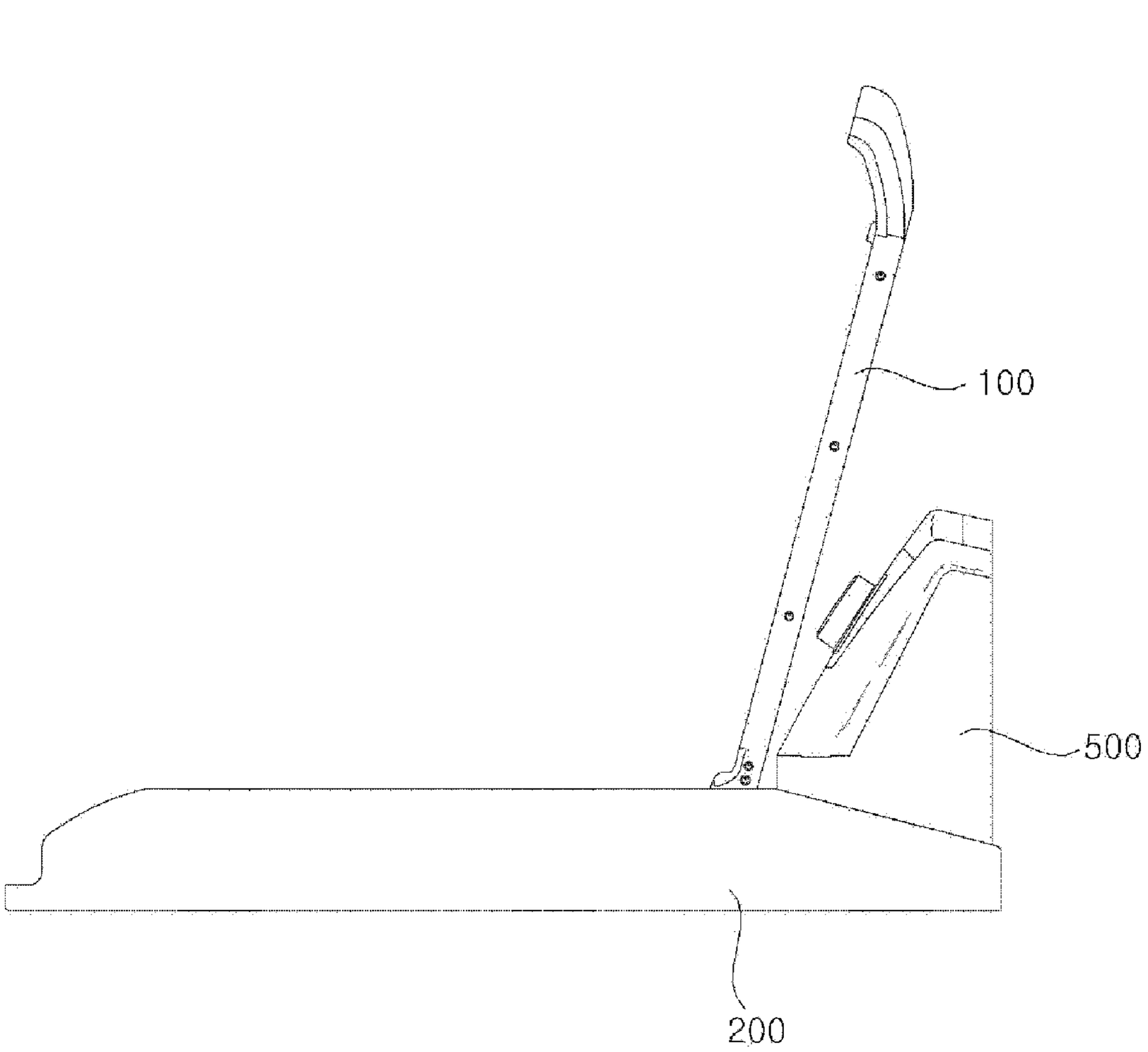


FIG. 6

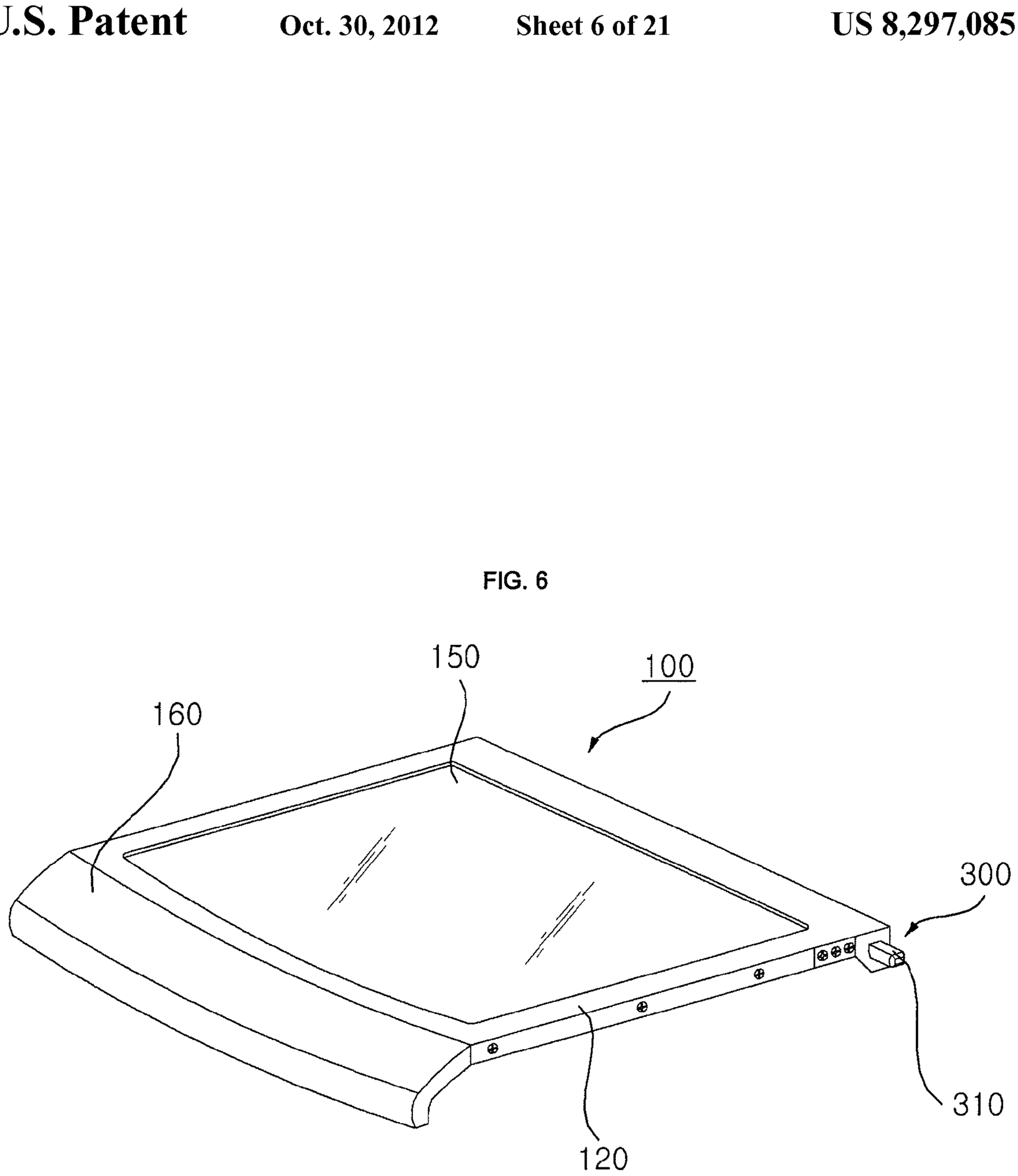


FIG. 7

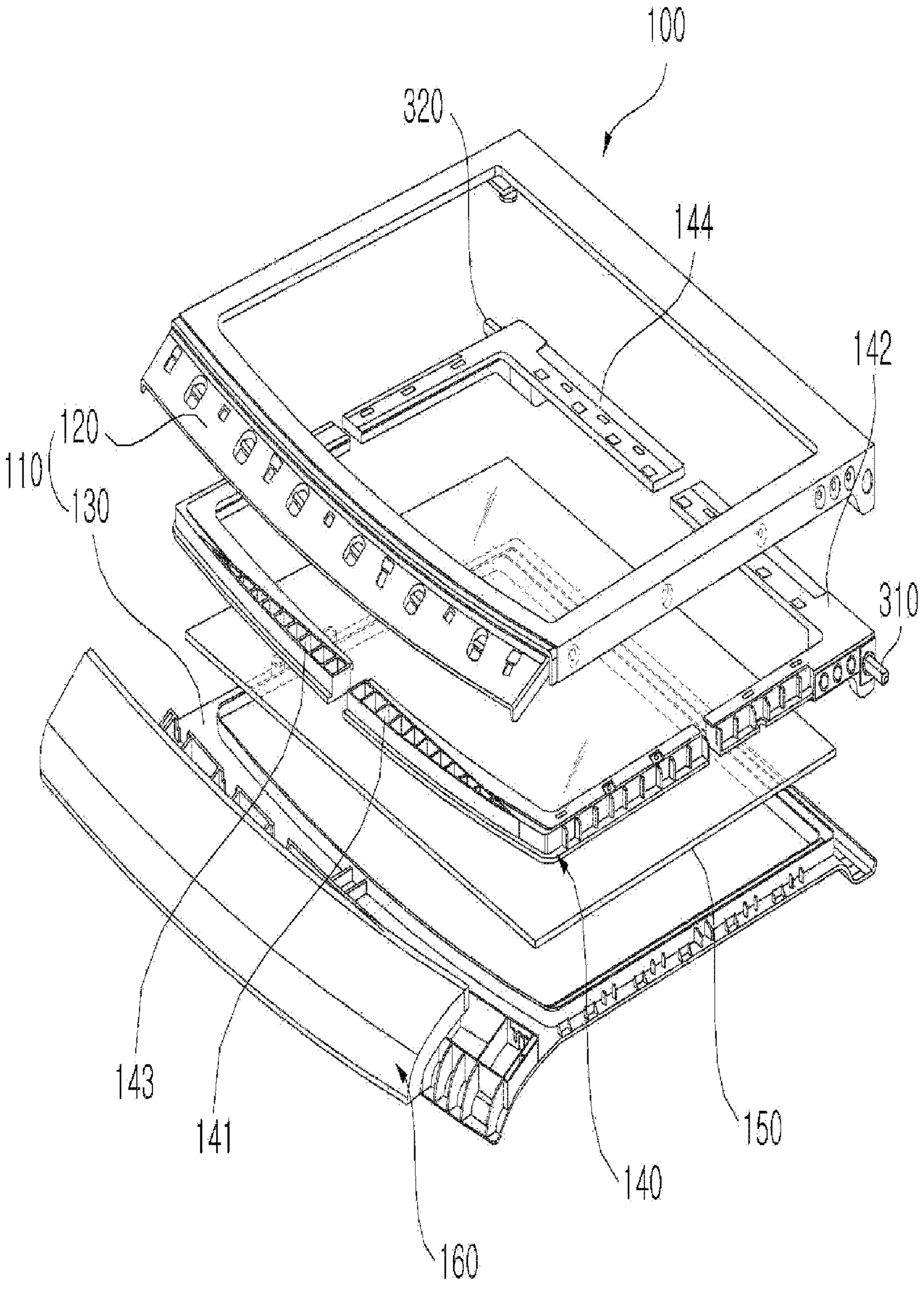
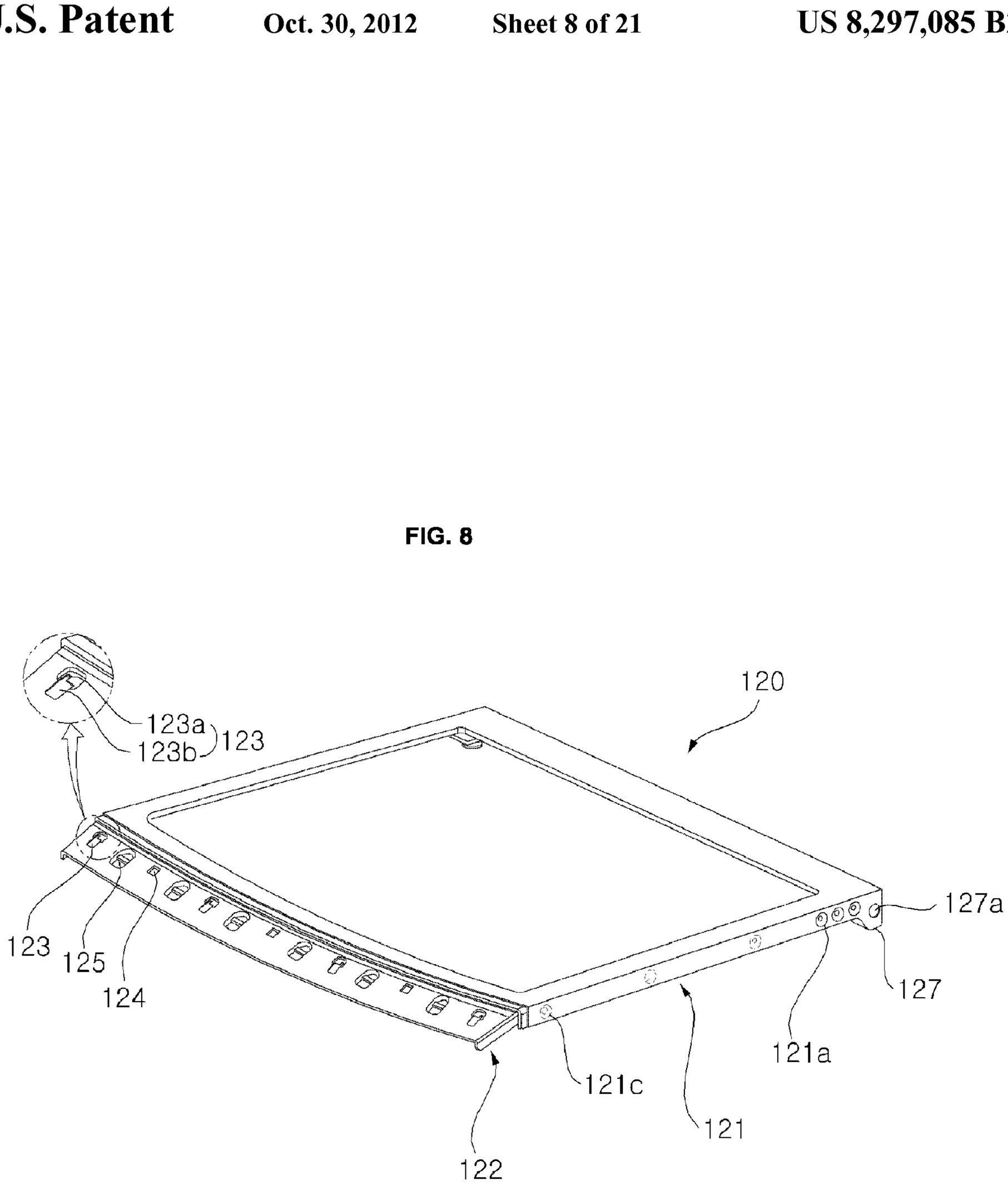


FIG. 8



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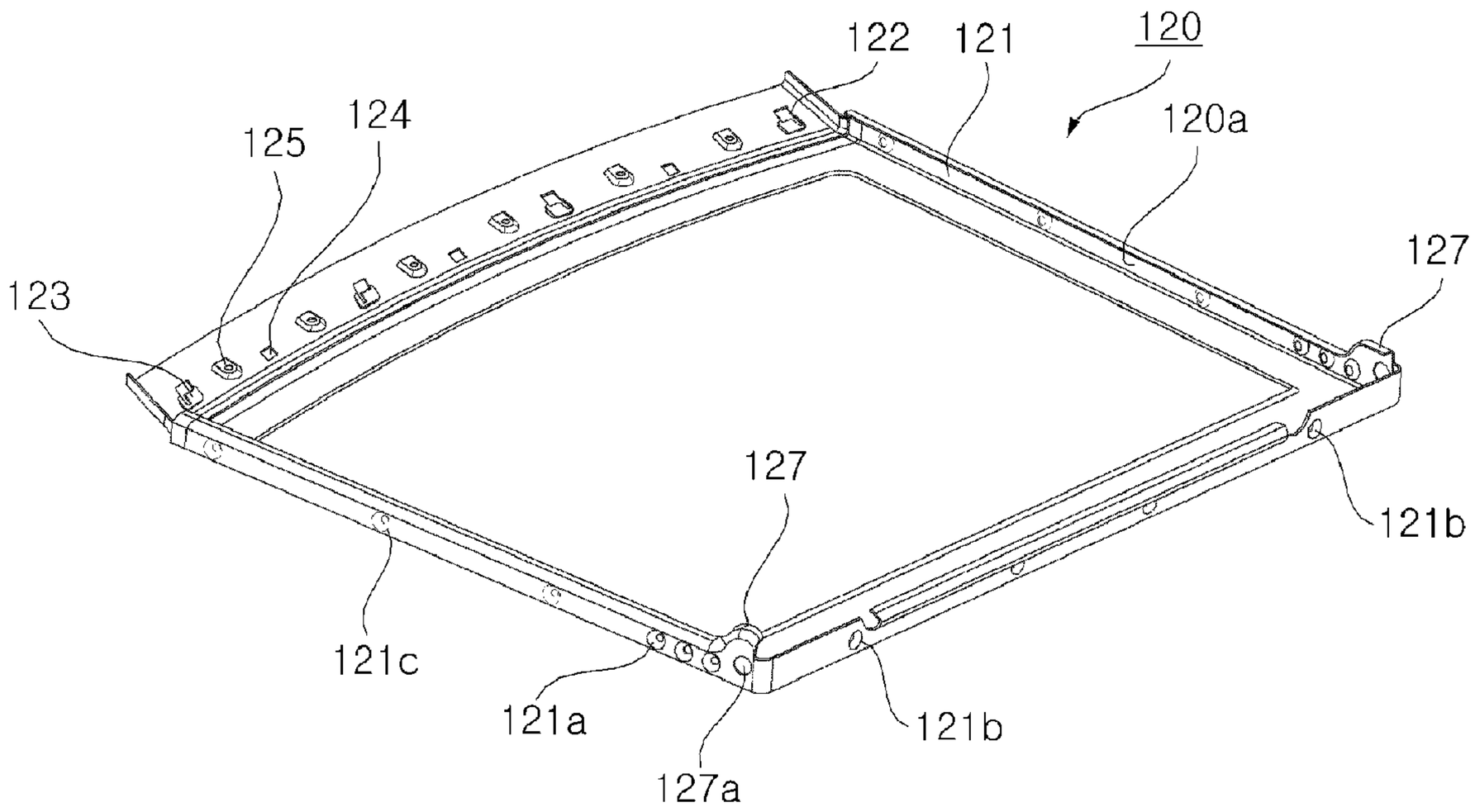

FIG. 10

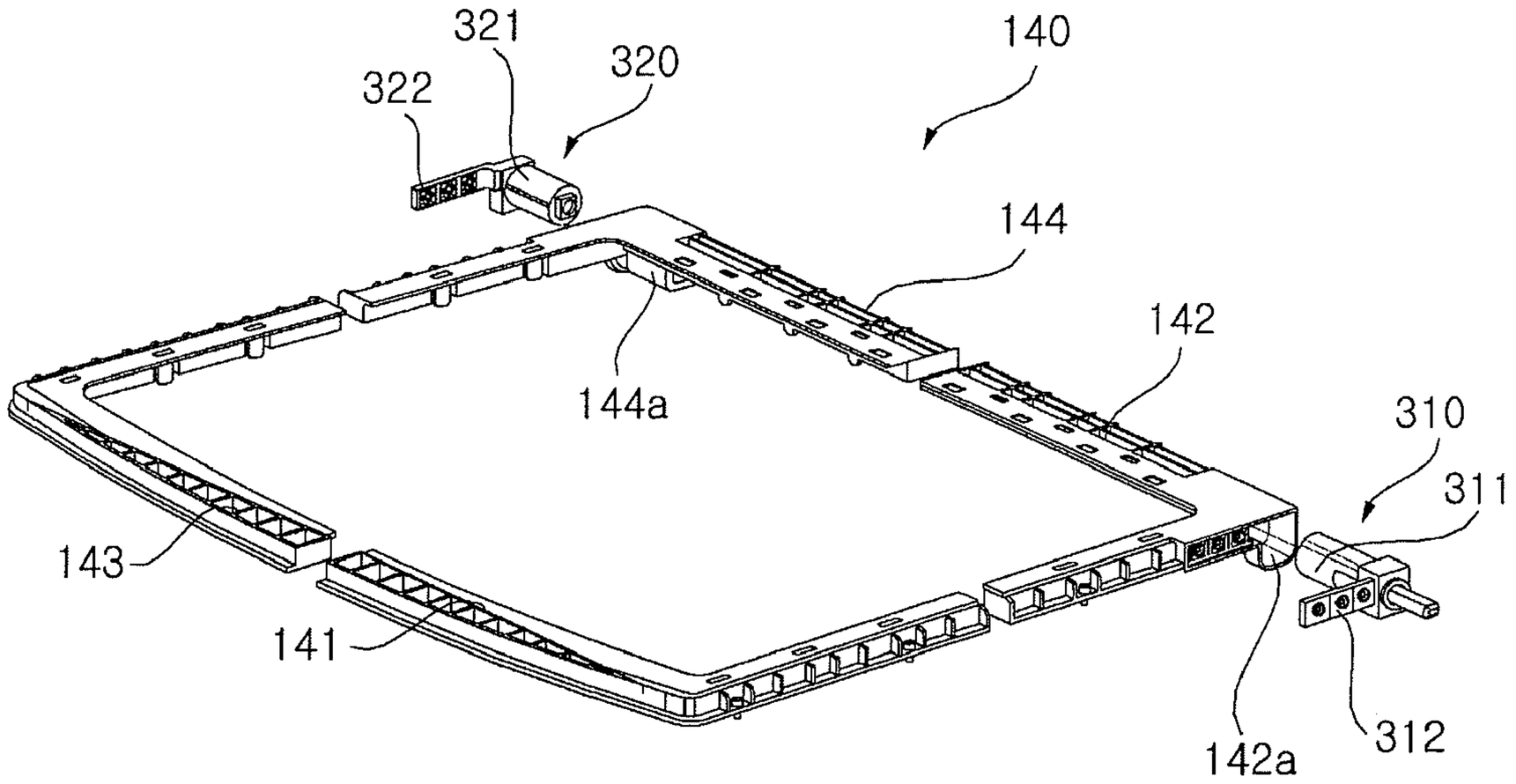
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FIG. 11

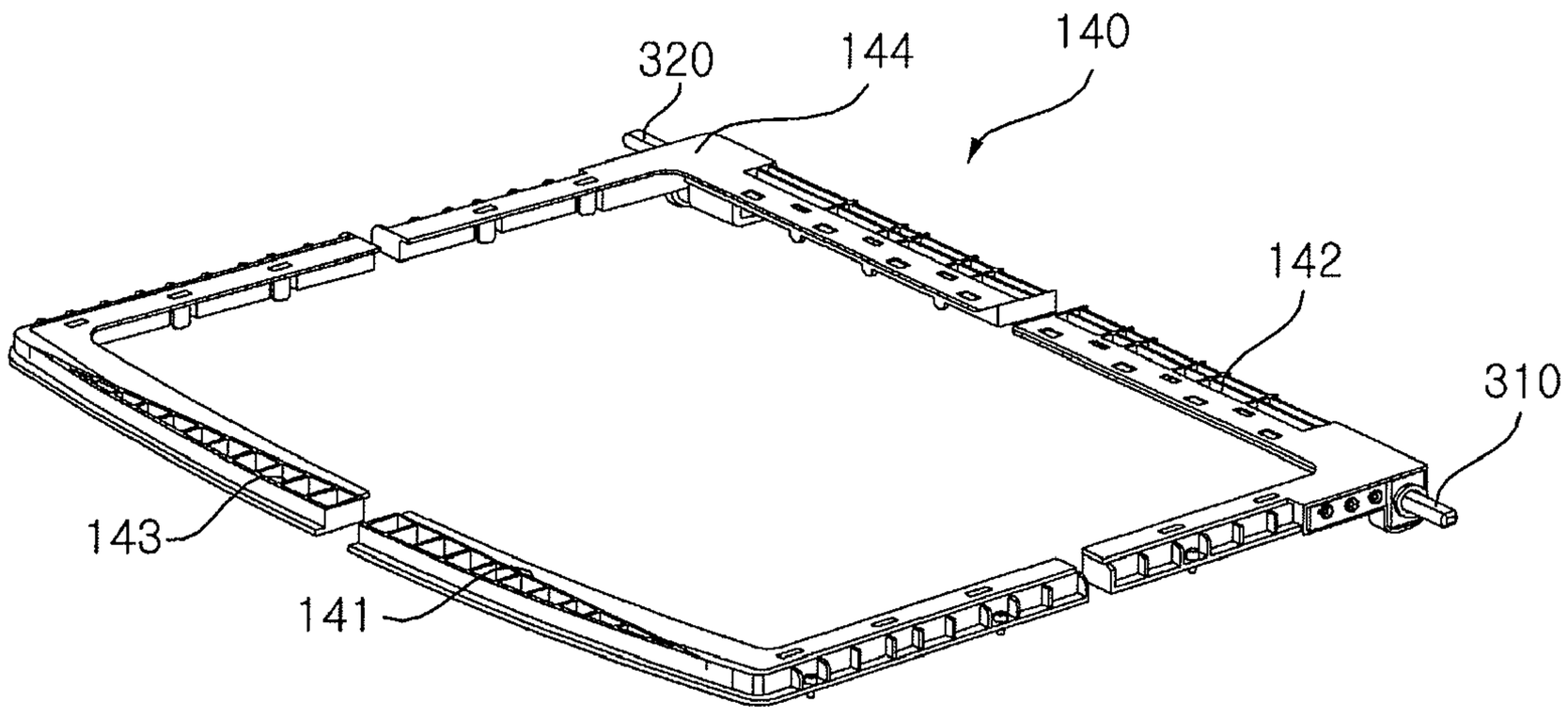
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FIG. 12

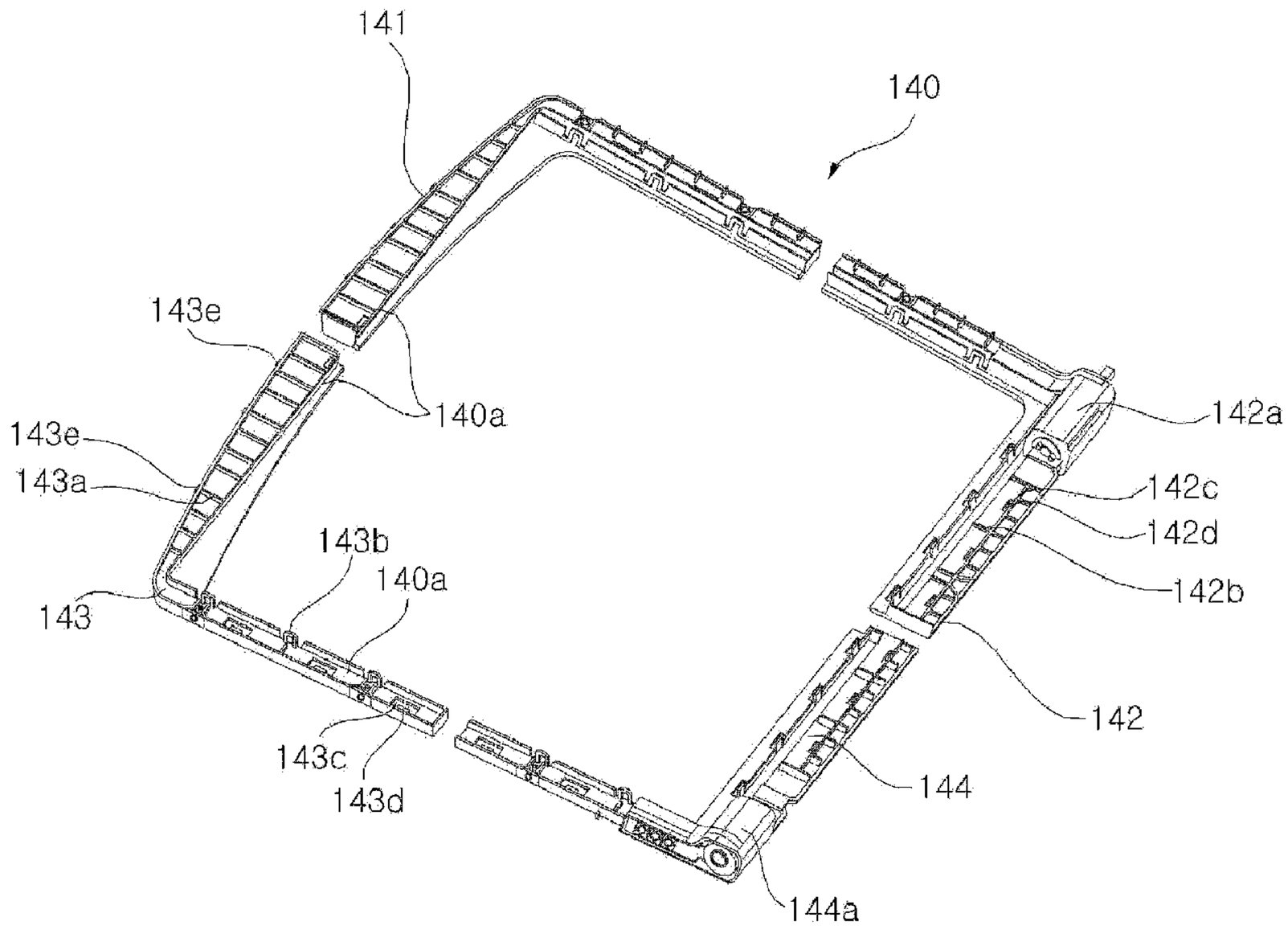
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FIG. 13

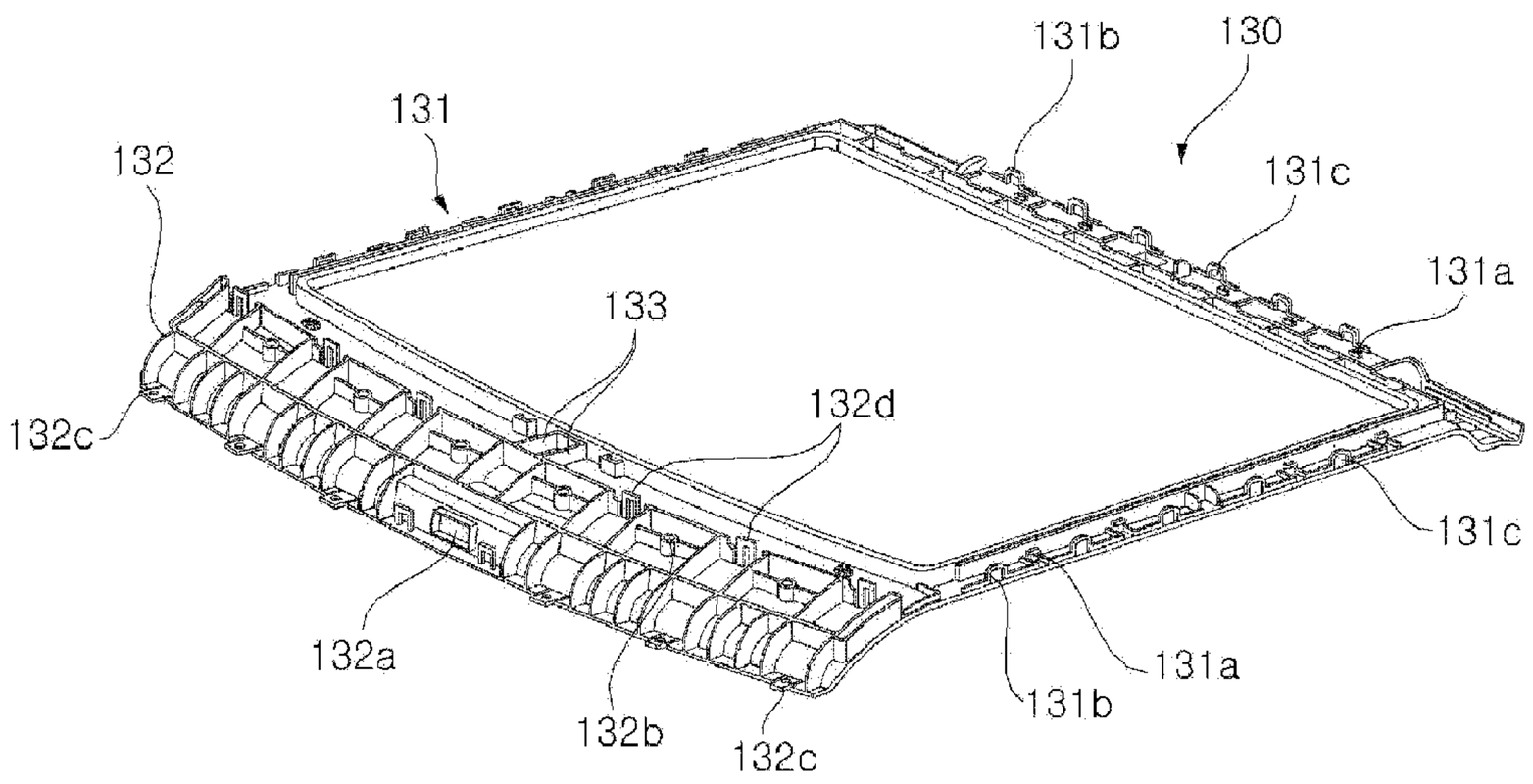
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FIG. 14

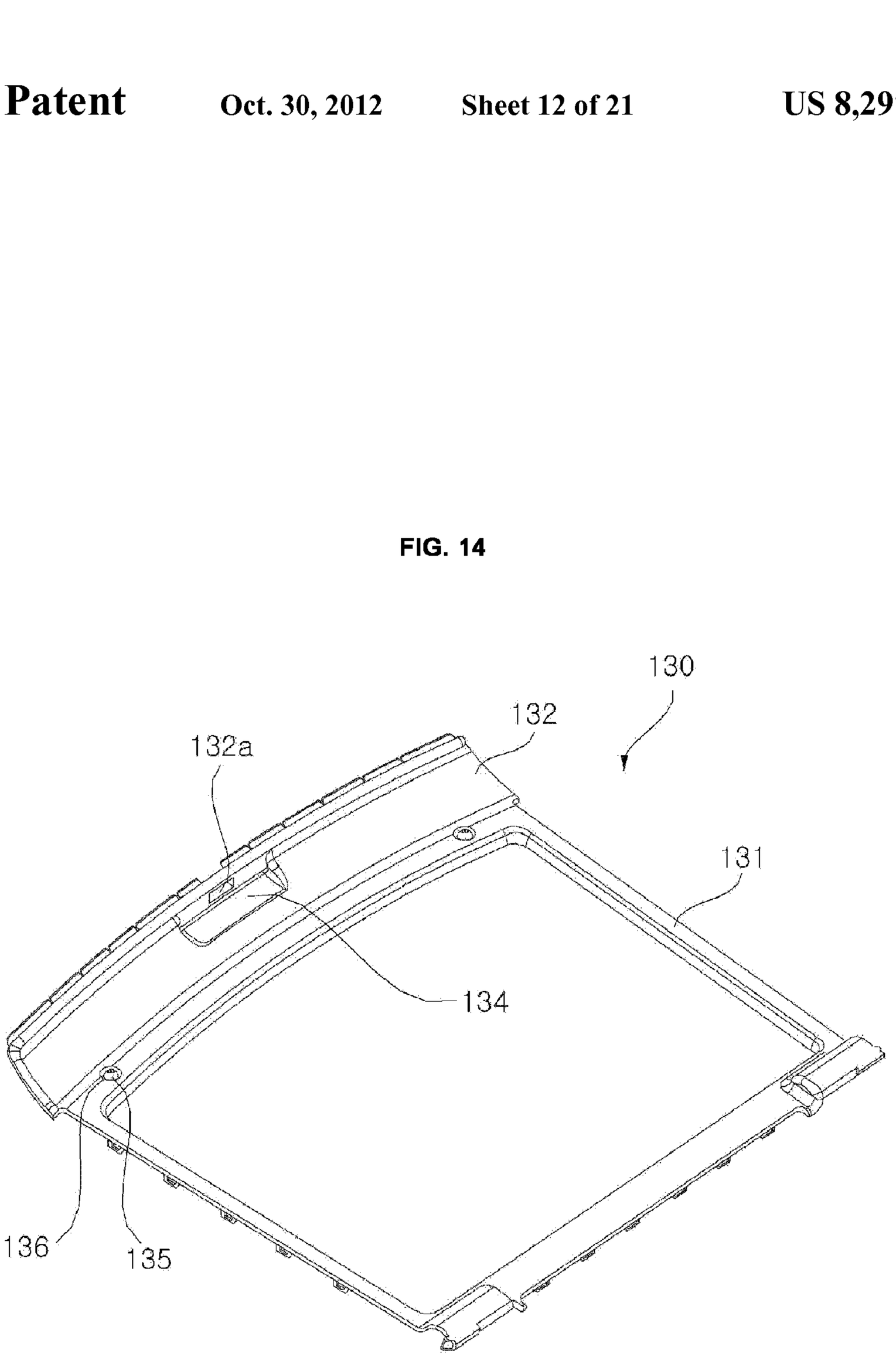


FIG. 15

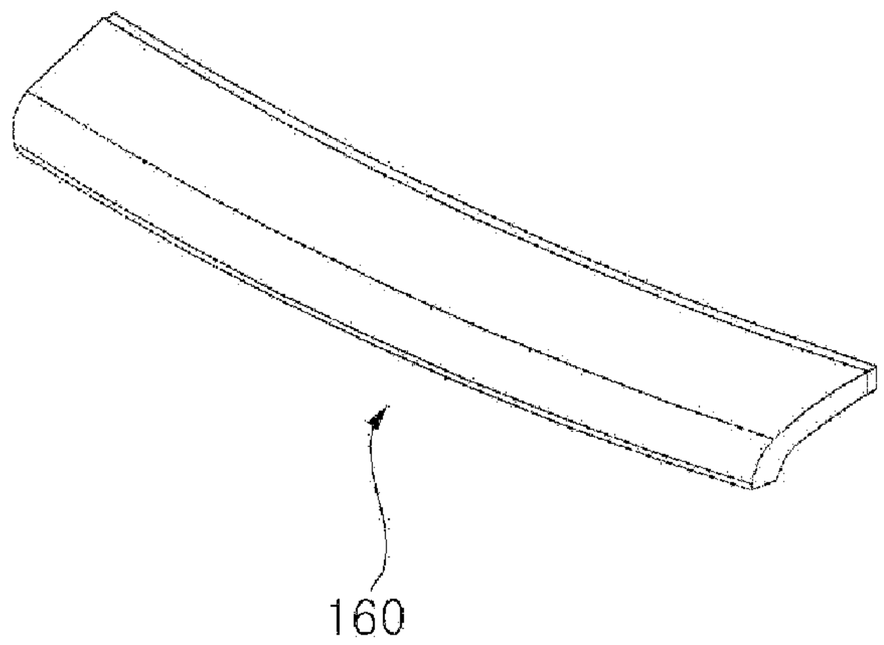


FIG. 16

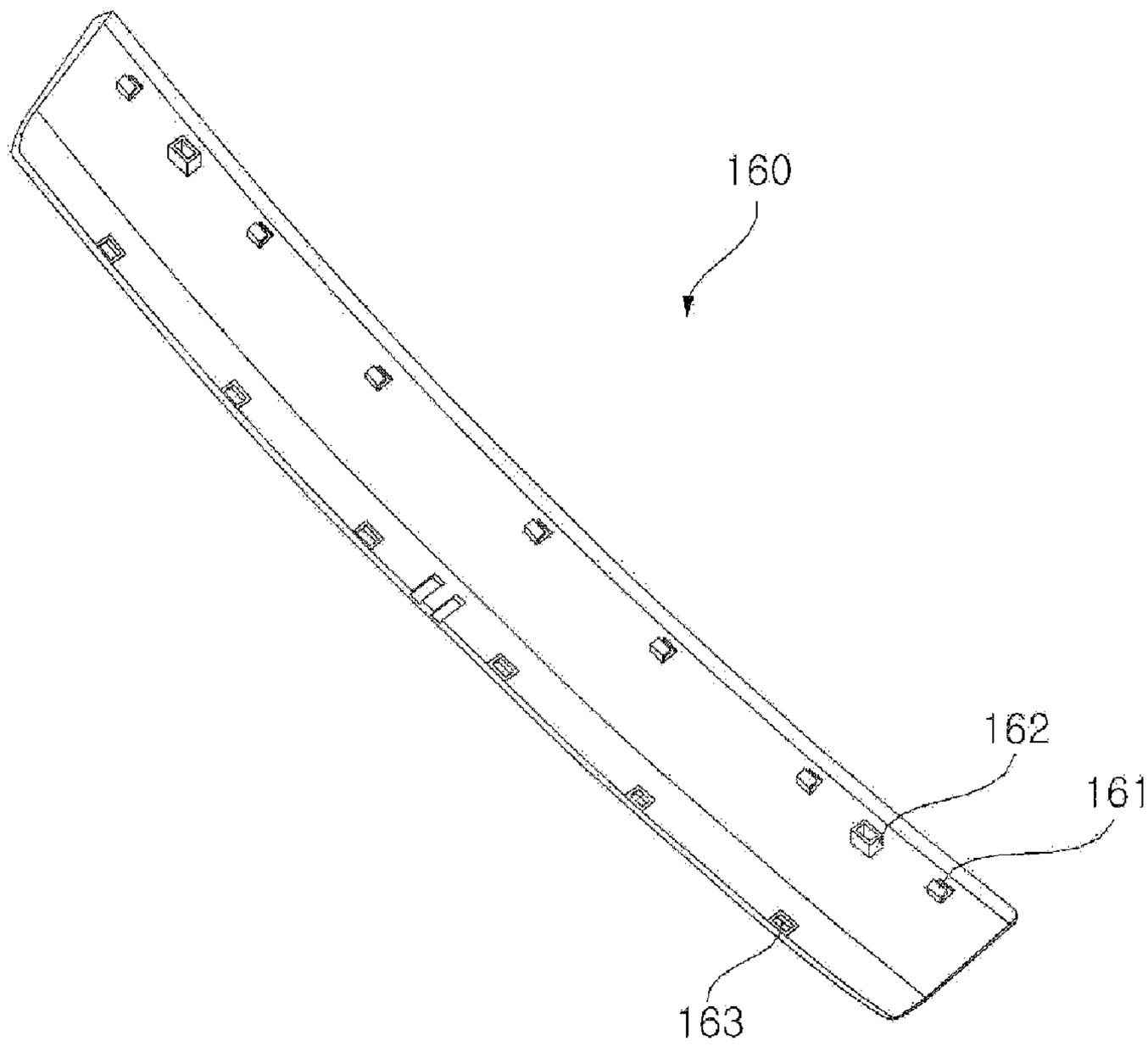


FIG. 17

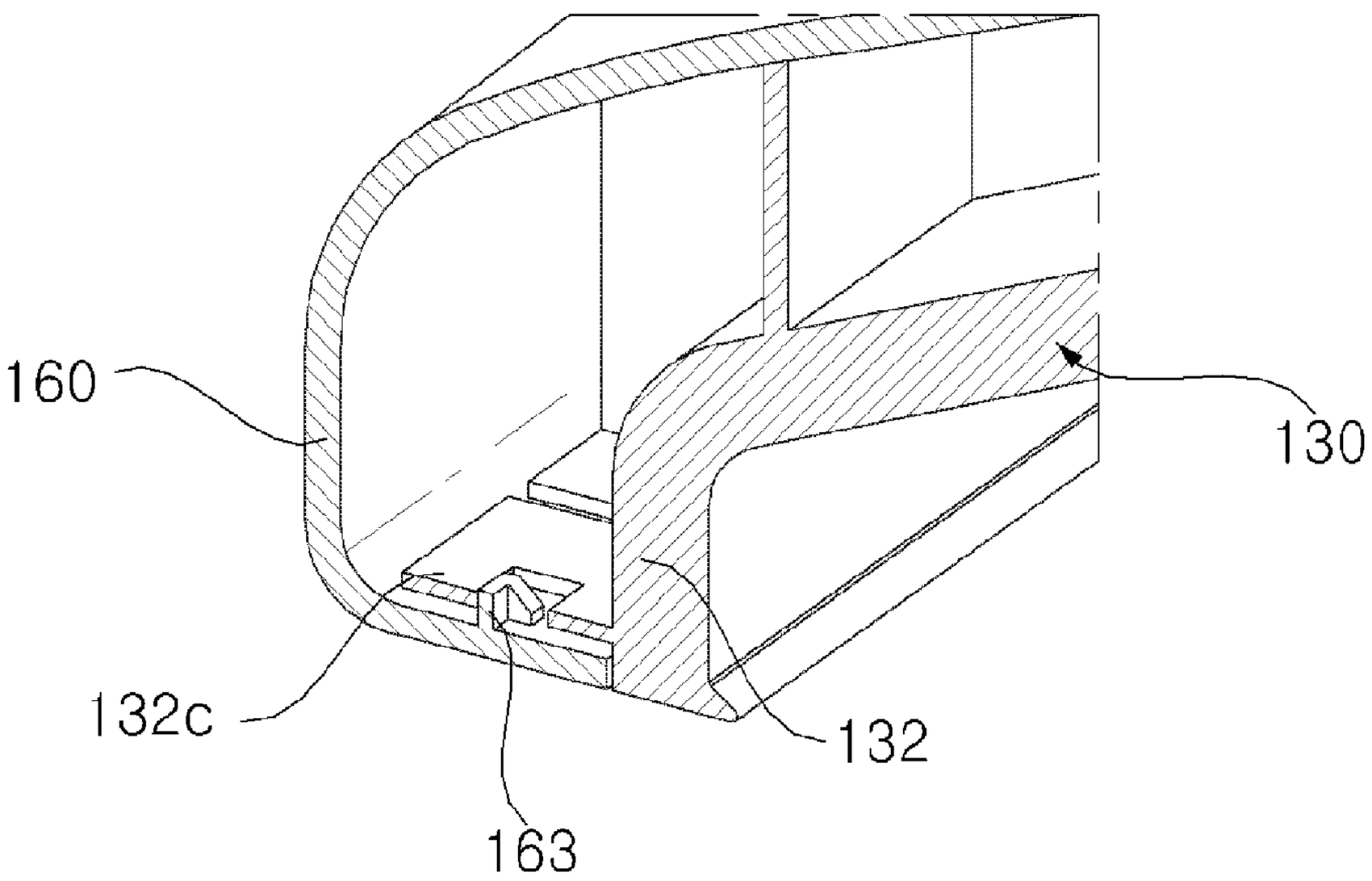


FIG. 18

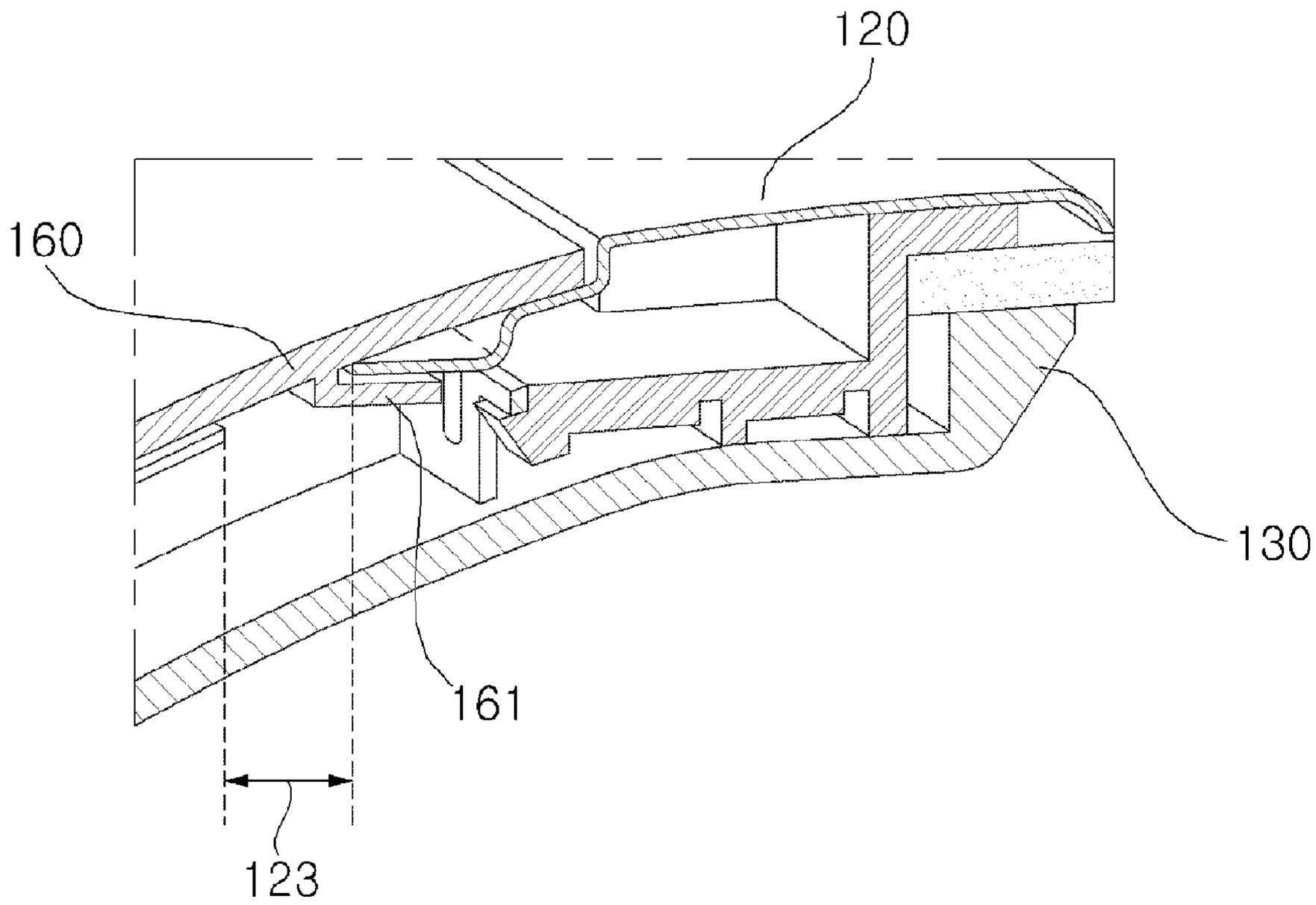


FIG. 19

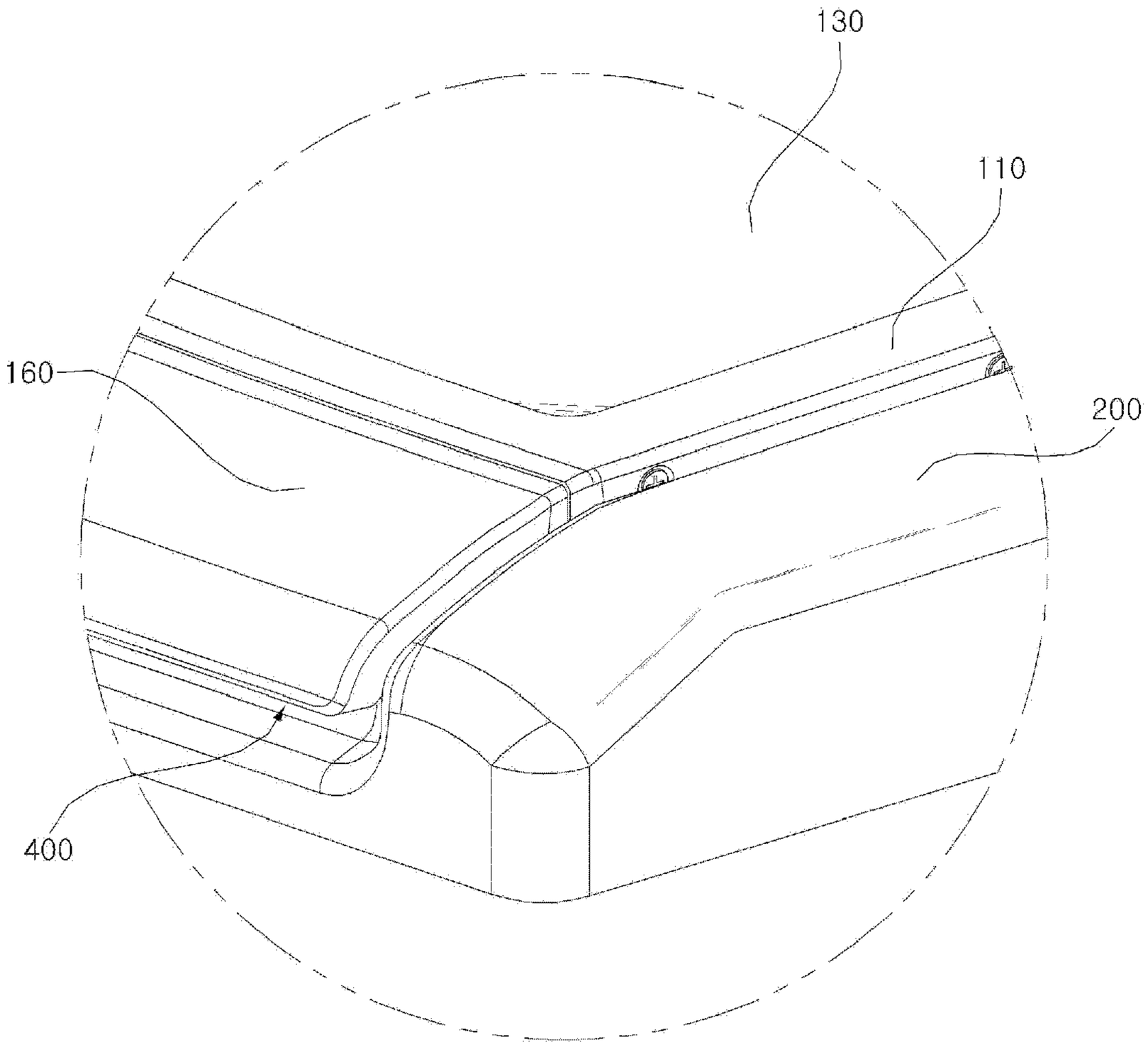


FIG. 20

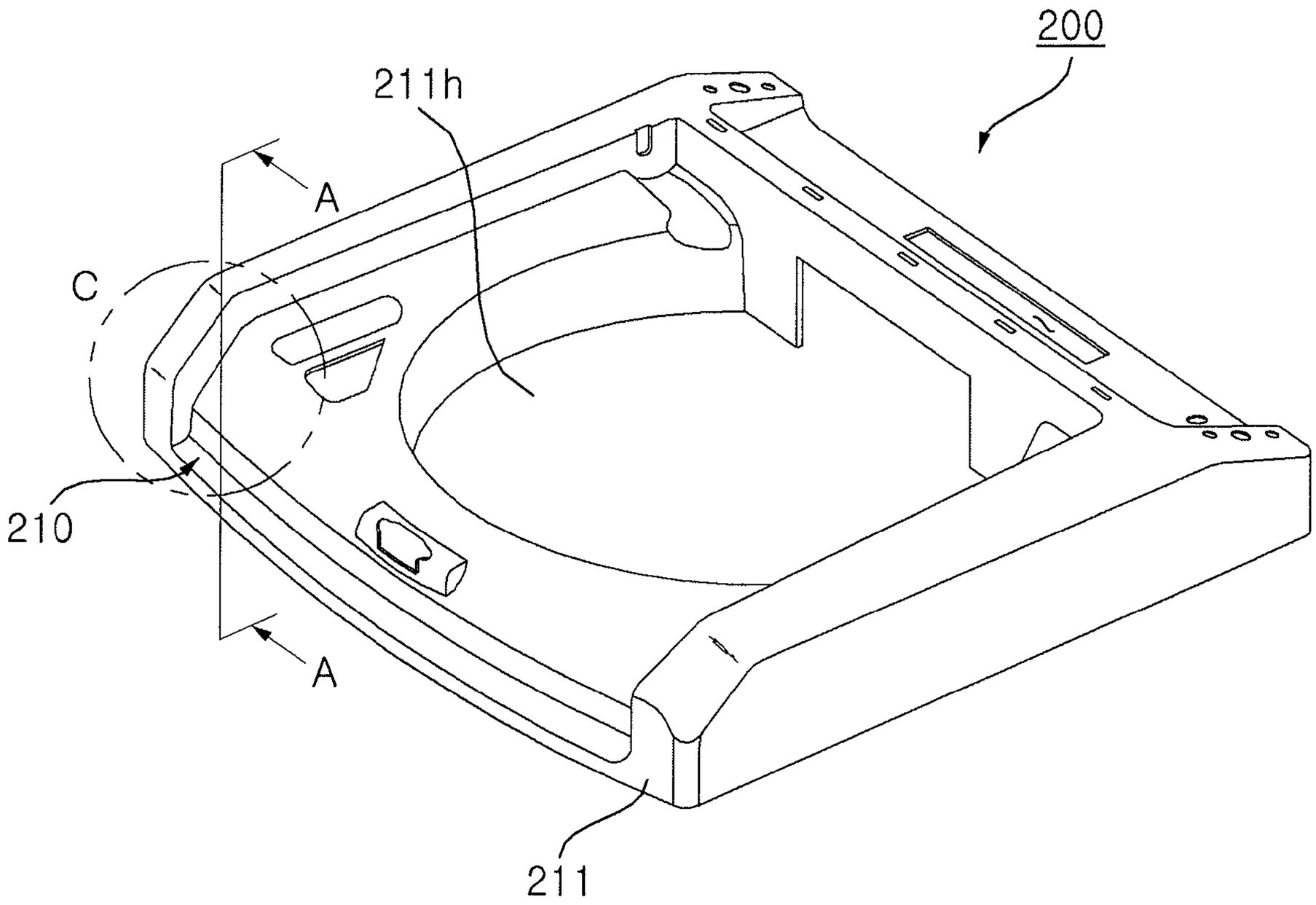


FIG. 21

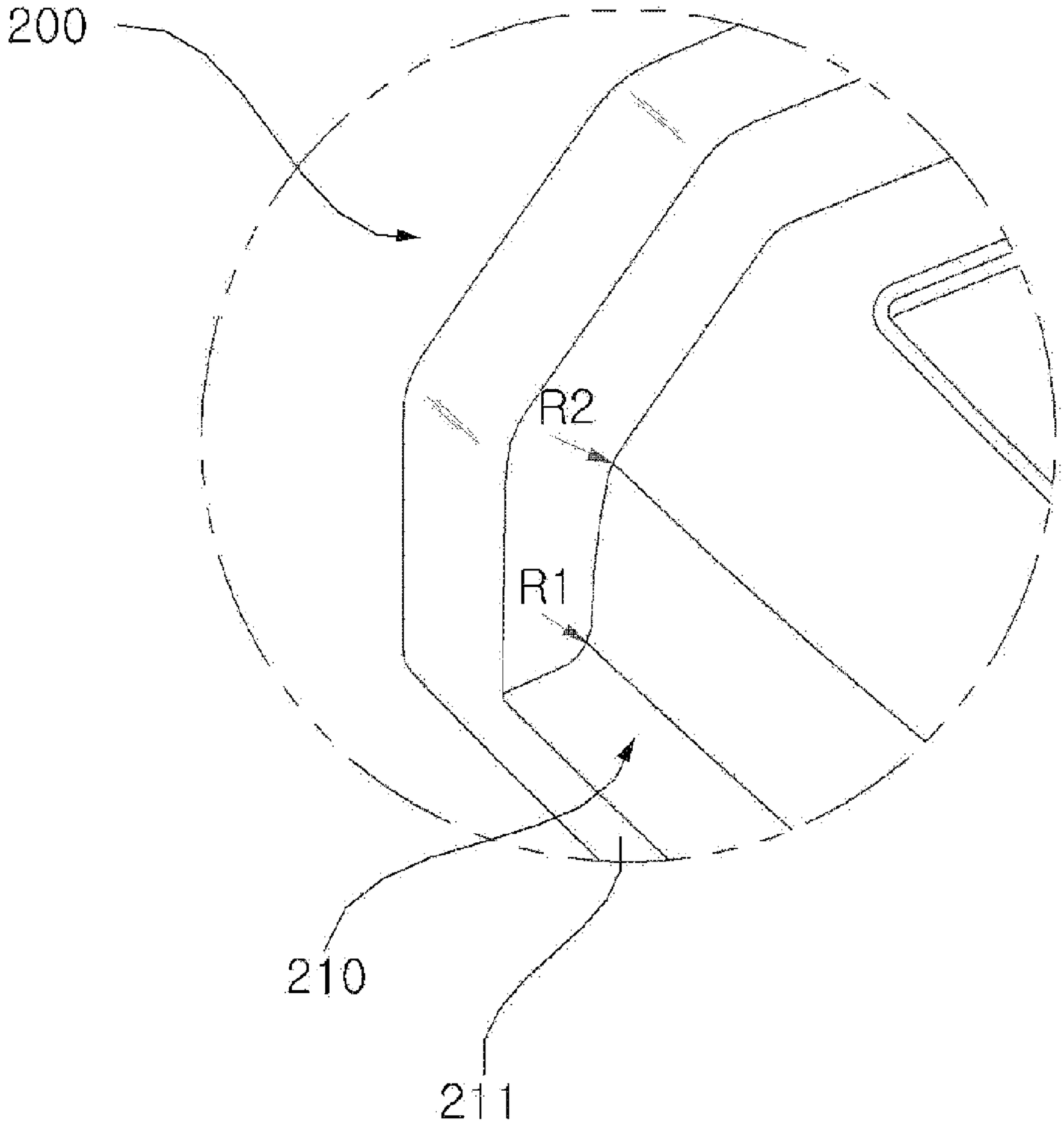


FIG. 22

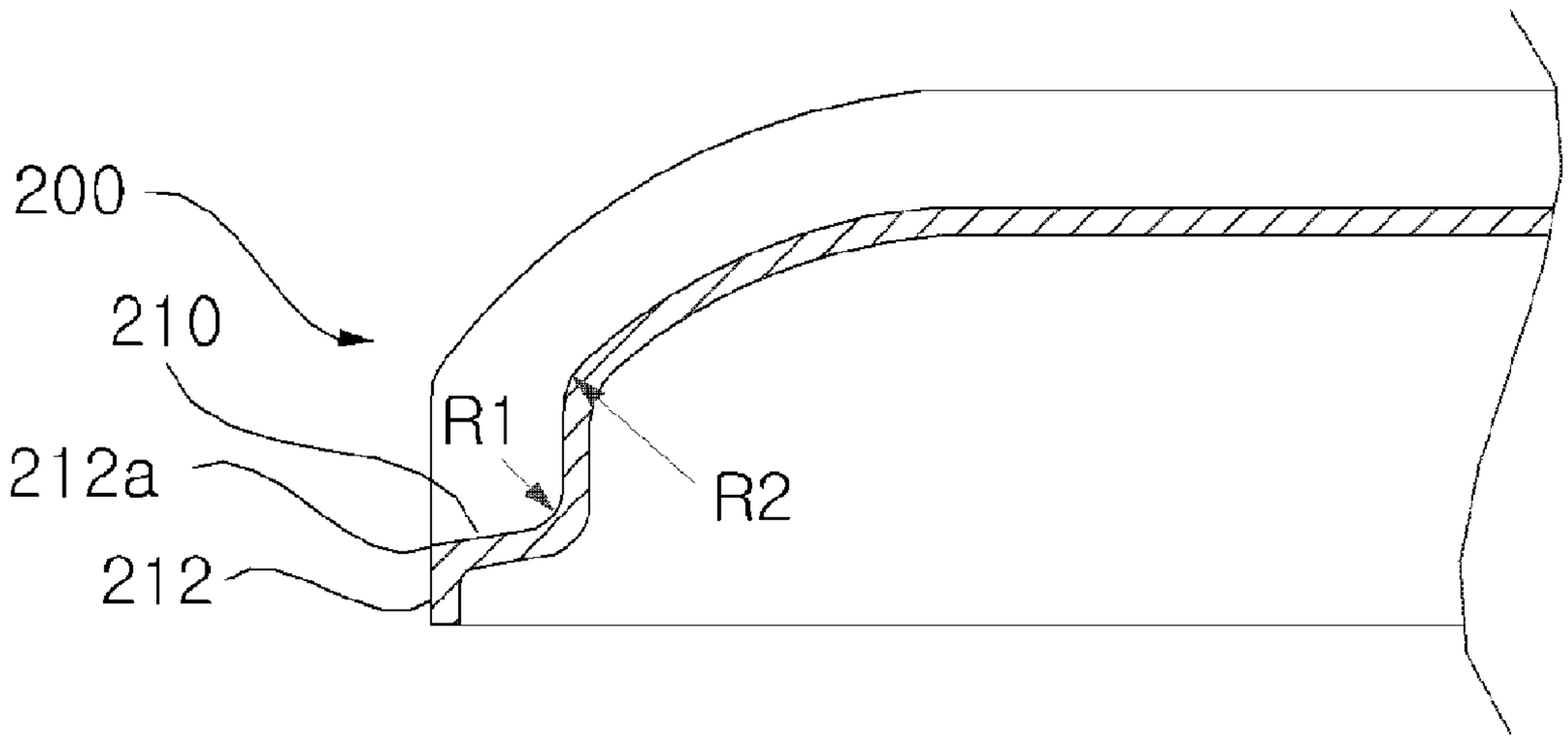


FIG. 23

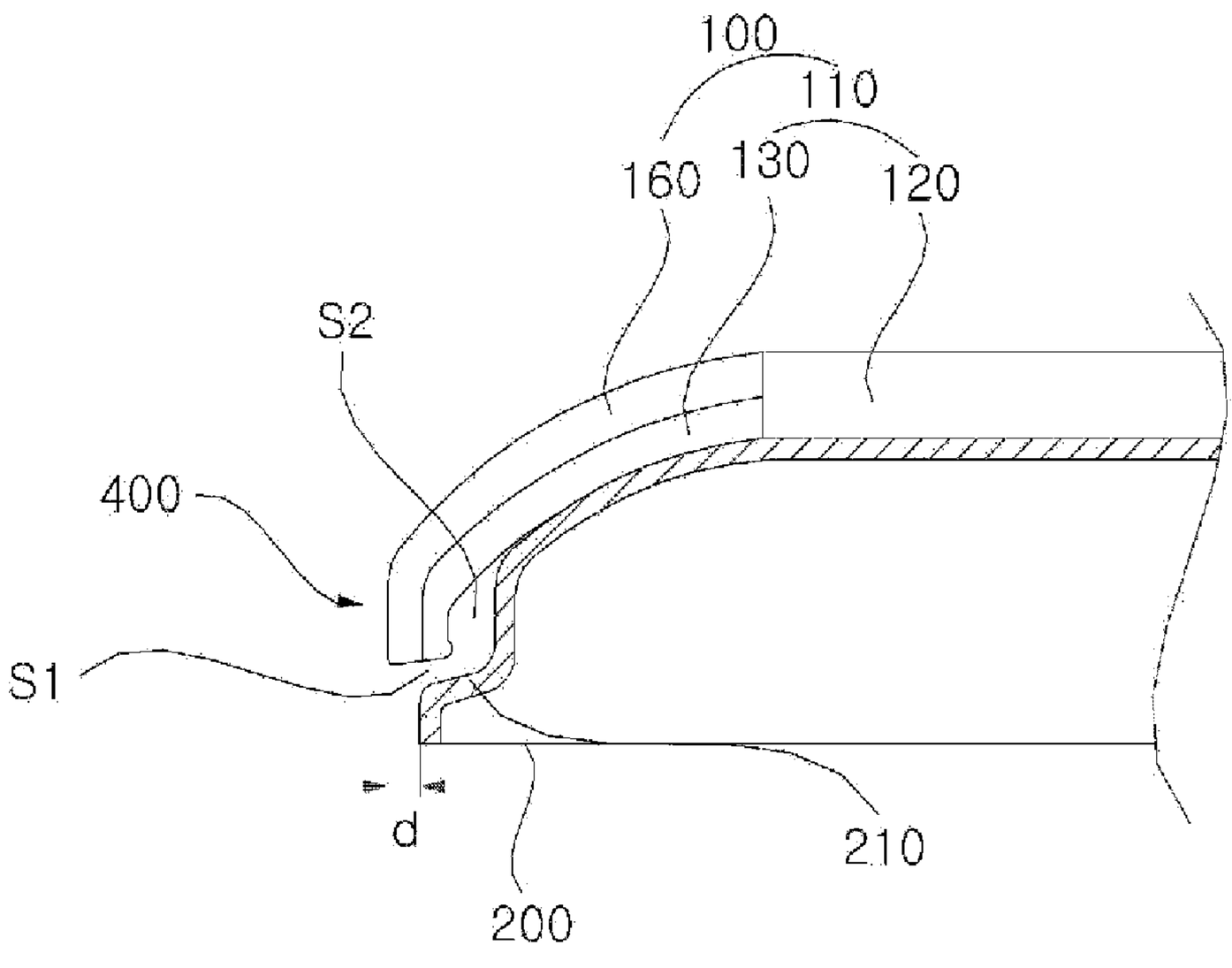


FIG. 24

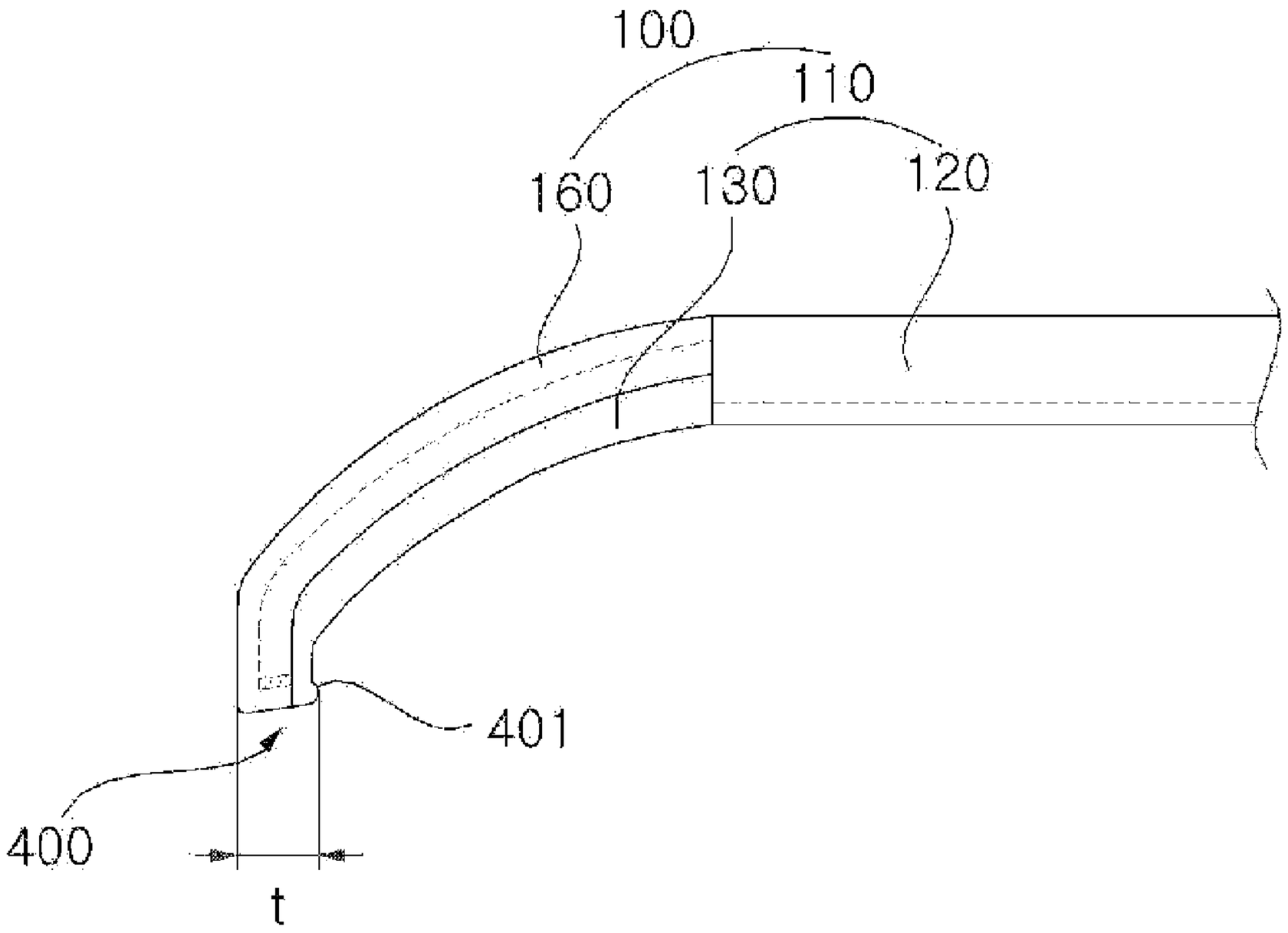
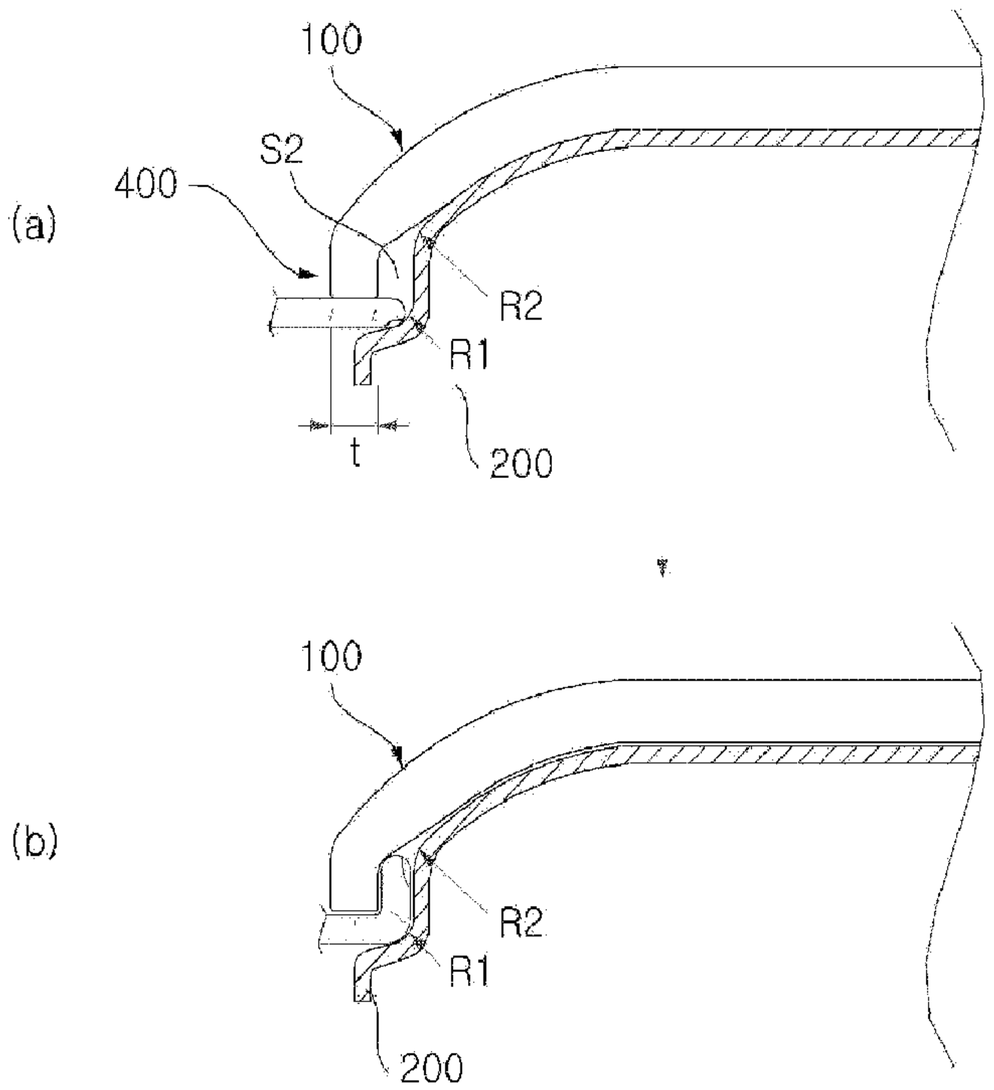


FIG. 25



WASHING MACHINE

CROSS-REFERENCE TO RELATED APPLICATION

This application claims priority to Korean Patent Application No. 10-2009-0071056 filed on Jul. 31, 2009 and No. 10-2009-0071057 filed on Jul. 31, 2009 and No. 10-2009-0071058 filed on Jul. 31, 2009 and No. 10-2009-99901 filed on Oct. 20, 2009 and No. 10-2009-99899 filed on Oct. 20, 2009 and No. 10-2009-99900 filed on Oct. 20, 2009, in the Korean Intellectual Property Office, and U.S. Provisional Patent Application No. 61/230,590, 61/230,510 and 61/230,613 filed on Jul. 31, 2009 in the USPTO, the contents of which are herein incorporated by reference in its entirety.

BACKGROUND OF THE INVENTION

1. Technical Field

This disclosure is directed to a washing machine, and more specifically, to a washing machine with a lid assembly which may be more securely assembled and provide stability and convenience of use.

2. Discussion of Related Art

In general, a washing machine may include a laundry washer that gets rid of contaminants from clothing or bedding (hereinafter, referred to as "laundry") using a chemical action between water and detergent and a mechanical action, and a dryer which dries wet laundry using air heated by a heater and a mechanical action. Also, a washing machine may have both a washing function and a drying function. Further, a washing machine may also include a refresher which sprays hot steam to laundry to prevent allergies. A washing machine may include various devices which exert physical or chemical actions to laundry to clean the laundry.

Washing machines may be categorized based on the location of a laundry entrance hole. For example, top load type washing machine have a laundry entrance hole at an upper surface of a cabinet and wash the laundry by a rotational water current generated when a washing tub rotates. Drum type washing machines have a laundry entrance hole at a front surface of a cabinet and wash the laundry by dropping the laundry in a drum while rotating the drum.

A lid assembly is arranged at an upper side of the cabinet of a top load type washing machine to open and close the laundry entrance hole.

SUMMARY OF THE INVENTION

Exemplary embodiments of the present invention provide a washing machine with a lid assembly which may provide aesthetic appearance, stability, and convenience of use.

According to an embodiment, there is provided a washing machine comprising: a cabinet; a top cover which is arranged at an open top surface of the cabinet and has a laundry entrance hole; and a lid assembly which is arranged at the top cover and opens/closes the laundry entrance hole, wherein a handle is provided at a front side of the lid assembly and is protruded forwards more than the top cover, and the handle and the top cover are arranged to be spaced apart from each other in upper and lower directions and in front and rear directions, thereby defining spaces between the handle and the top cover so a user's hand is inserted into the spaces to hold the handle and lifts the lid assembly.

According to an embodiment, a step part is provided at a front portion of the top cover to be spaced apart from the handle by a predetermined interval.

According to an embodiment, the step part includes a first rounded part which faces a user's fingertip inserted toward the step part and is bent upwards with a predetermined curvature, and a second rounded part which is extended upwards from the first rounded part and bent rearwards with a predetermined curvature.

According to an embodiment, a portion where a front surface portion of the top cover and the step part meet is rounded with a predetermined curvature.

According to an embodiment, the lid assembly includes a lid frame which forms the appearance, a lid inner coupled to an interior of the lid frame and has a hinge unit, and a decoration panel coupled to a front side of the lid frame, wherein the handle is a lower portion of a combined part that a front portion of the lid frame and a front portion of the decoration panel are combined.

According to an embodiment, the lid frame includes an upper lid frame which forms an upper portion of the lid frame and supports the lid inner, and a lower lid frame which is coupled to a lower side of the upper lid frame and forms a lower portion of the lid frame, wherein the handle is a lower portion of a combined part that a front portion of the lower lid frame and a front portion of the decoration panel are combined.

According to an embodiment, a thickness of a lower portion of the handle ranges from 15 mm to 17 mm in front and rear directions.

According to an embodiment, a lower portion of the handle has a protrusion which protrudes towards the top cover.

According to an embodiment, the decoration panel covers part of a front upper surface of the upper lid frame and is hooked and coupled to a front lower portion of the lower lid frame.

According to an embodiment, a front portion of the upper lid frame is formed to be inclined by a predetermined angle, wherein the decoration panel is formed to be inclined to correspond to the upper lid frame, wherein a front lower portion of the decoration panel is rounded.

According to an embodiment, a lower end of the decoration panel is arranged to be lower than a front end of the lower lid frame to cover the front end of the lower lid frame.

According to an embodiment, the decoration panel slides and coupled to a front upper surface of the upper lid frame.

According to an embodiment, the decoration panel includes an upper connecting protrusion which protrudes towards an upper surface of the upper lid frame to be coupled to the upper lid frame, and a lower connecting protrusion which protrudes towards the lower lid frame to be coupled to the lower lid frame.

According to an embodiment, the upper lid frame includes an upper connecting protrusion coupling hole to which the upper connecting protrusion is inserted and slides and is hooked, and the lower lid frame includes a lower connecting protrusion coupling hole to which the lower connecting protrusion is inserted.

According to an embodiment, the upper connecting protrusion protrudes towards the upper lid frame from the decoration panel and then is bent to be shaped as a hook.

According to an embodiment, the lower connecting protrusion protrudes upwards from a lower portion of an inner surface of the decoration panel to be press-fittingly coupled to the lower lid frame in upper and lower directions.

According to an embodiment, the upper connecting protrusion coupling hole includes an inserting hole to which the upper connecting protrusion is inserted, and a hooked part extended from the inserting hole and guides a sliding movement of the upper connecting protrusion and has a width

narrower than the inserting part so that the upper connecting protrusion is hooked to the hooked part.

According to an embodiment, the decoration panel includes a guide protrusion which protrudes towards an upper surface of the upper lid frame and guides an assembling position, and the upper lid frame includes a guide protrusion coupling hole to which the guide protrusion is coupled.

According to an embodiment, there is provided a washing machine comprising: a top cover having a laundry entrance hole; a lid assembly arranged to be able to rotate at an upper side of the top cover and opens/closes the laundry entrance hole, wherein the lid assembly includes an upper lid frame forming an upper portion of the lid frame, a lower lid frame forming a lower portion of the lid frame, and a decoration panel including an upper portion which slides and is coupled to a front upper side of the upper lid frame and a lower portion coupled to the lower lid frame.

According to an embodiment, there is provided a washing machine comprising: a cabinet having a laundry entrance hole at an upper side; and a lid assembly is arranged to be able to rotate at an upper side of the cabinet and opens/closes the laundry entrance hole, wherein the lid assembly includes an upper lid frame forming an upper portion of the lid frame, a lower lid frame forming a lower portion of the lid frame, and a decoration panel coupled to a front portion of the upper lid frame and the lower lid frame to define a handle and covers one part of a front end of the lower lid frame.

In the washing machine according to an embodiment of the present invention, the handle is provided at a front lower portion of the lid assembly so that a user may hold the handle. A space is provided between the handle and the top cover so that the user's hand may be inserted into the space to hold the handle and lift the lid assembly. Accordingly, it is not necessary to separately add a handle to the exterior of the lid assembly or form a groove which replaces the handle. This simplifies the structure of the lid assembly, thus preventing dirt or dust from being attached to the surface of the lid assembly and providing a beautiful appearance.

Further, the space between the lid assembly and the top cover functions as a groove for handle, and this allows a user to easily hold and lift the lid assembly. Accordingly, convenience of use may be provided.

Further, since the front portion of the top cover is rounded, it can prevent that user's fingertips or fingernails are damaged when the user's hand is inserted. Accordingly, stability may be provided.

Further, the washing machine according to an embodiment of the present invention includes an upper lid frame, a lower lid frame, and a decoration panel which slides and then is coupled to the front portion of the lid frame. Accordingly, the lid frame may be easily assembled.

Further, the decoration panel covers a gap between the upper and lower lid frames. This may provide an aesthetic beautiful appearance.

BRIEF DESCRIPTION OF THE DRAWING

FIG. **1** is a perspective view illustrating a washing machine according to an embodiment of the present invention.

FIG. **2** is a cross sectional view of the washing machine shown in FIG. **1**.

FIG. **3** is a perspective view illustrating the top cover and the lid assembly shown in FIG. **1**.

FIG. **4** is a cross sectional view of FIG. **3**.

FIG. **5** is a side view of FIG. **3** wherein the lid assembly is left open.

FIG. **6** is a perspective view illustrating the lid assembly shown in FIG. **3**.

FIG. **7** is an exploded perspective view illustrating the lid assembly shown in FIG. **6**.

FIG. **8** is a perspective view illustrating an upper surface of the upper lid frame shown in FIG. **7**.

FIG. **9** is a perspective view illustrating a lower surface of the upper lid frame shown in FIG. **8**.

FIG. **10** is an exploded perspective view illustrating lid inners and hinge units dissembled from each other.

FIG. **11** is a perspective view illustrating lid inners and hinge units assembled to each other.

FIG. **12** is a perspective view illustrating a bottom surface of the lid inners shown in FIG. **11**.

FIG. **13** is a perspective view illustrating the lower lid frame shown in FIG. **3**.

FIG. **14** is a perspective view illustrating the lower surface of the lower lid frame shown in FIG. **13**.

FIG. **15** is a perspective view illustrating the decoration panel shown in FIG. **3**.

FIG. **16** is a perspective view illustrating a lower surface of the decoration panel shown in FIG. **15**.

FIG. **17** is a cross sectional view illustrating a combined structure of a decoration panel and a lower lid frame according to an embodiment of the present invention.

FIG. **18** is a cross sectional view illustrating a combined structure of a decoration panel and an upper lid frame according to an embodiment of the present invention.

FIG. **19** is an expanded perspective view of part B shown in FIG. **3**.

FIG. **20** is a perspective view illustrating the top cover shown in FIG. **3**.

FIG. **21** is an expanded perspective view of part C shown in FIG. **20**.

FIG. **22** is a cross sectional view as viewed in the direction of arrow A of FIG. **20**.

FIG. **23** is a view illustrating a situation where the lid assembly shown in FIG. **22** is closed.

FIG. **24** is a side view illustrating the lid assembly shown in FIG. **23**.

FIG. **25** illustrates a process where a lid assembly is opened by a user's hand.

DETAILED DESCRIPTION

Hereinafter, exemplary embodiments of a top load type washing machine (hereinafter, referred to as "washing machine") will be described in greater detail with reference to the accompanying drawings.

FIG. **1** is a perspective view illustrating a washing machine according to an embodiment of the present invention and FIG. **2** is a cross sectional view of the washing machine shown in FIG. **1**.

Referring to FIGS. **1** and **2**, the washing machine W includes a cabinet **10**, a top cover **200**, a lid assembly **100**, and a control panel **500**. The top cover **200** is arranged at an upper side of the cabinet **10** and includes a laundry entrance hole **211***h*. The lid assembly **100** is rotatably connected with the top cover **200** to open and close the laundry entrance hole **211***h*. The control panel **500** allows a user to control the washing machine W.

Referring to FIG. **2**, an outer tub **30** is supported by a support member **20** inside the cabinet **10**. An inner tub **35** for containing laundry is rotatably arranged inside the outer tub **30**.

An upper end of the support member **20** is connected to the top cover **200** or an upper side of the cabinet **10**. A damper **25**

connected to a lower portion of the outer tub **30** is provided at a lower end of the support member **20**.

A plurality of pores is provided along the circumferential surface of the inner tub **35**. A pulsator **40** is positioned at the bottom surface of the inner tub **35** to generate rotational water current.

A motor **55** is positioned at a lower portion of the outer tub **30** to rotate the inner tub **35** and the pulsator **40**. The motor **55** is connected to the inner tub **35** via a rotational shaft to rotate the inner tub **35**. A clutch (not shown) is positioned between the inner tub **35** and the pulsator **40** to selectively transfer a rotational force to at least one of the inner tub **35** and the pulsator **40**. By the clutch, either or both of the inner tub **35** and the pulsator **40** may be rotated.

A detergent box is positioned at the top cover **200** to receive a detergent.

The washing machine W further includes a water supply hose **75** which guides water from an external tab (not shown) to the detergent box **60** and a water supply valve (not shown) which opens/closes washing water passing through the water supply hose **75**.

The washing machine W further includes a drainage hose **80** connected to a lower portion of the outer tub **30** to guide washing water from the outer tub **30** to the outside, a drainage pump **86** which pumps washing water in the outer tub **30**, and a drainage valve **85** which opens/closes washing water discharged through the drainage hose **80** to the outside.

FIG. **3** is a perspective view illustrating the top cover and the lid assembly shown in FIG. **1**, FIG. **4** is a cross sectional view of FIG. **3**, and FIG. **5** is a side view of FIG. **3** wherein the lid assembly is left open.

Referring to FIGS. **3** to **5**, the lid assembly **100** is rotatably connected to the top cover **200** to open/close the laundry entrance hole **211***h*. The lid assembly **100** may be rotatably connected to the top cover **200** by a hinge unit **300** which will be described below.

FIG. **6** is a perspective view illustrating the lid assembly shown in FIG. **3** and FIG. **7** is an exploded perspective view illustrating the lid assembly shown in FIG. **6**.

Referring to FIGS. **6** and **7**, the lid assembly **100** includes a lid frame **110** which forms the appearance of the lid assembly **100**, a lid inner **140** connected to the lid frame **110** at the inside of the lid frame **110** and has a hinge unit **300**, a glass unit **150** positioned at a portion where the lid frame **110** and the lid inner **140** are open, and a decoration panel **160** connected to the lid frame **110** at a front portion of the lid frame **110**.

Referring to FIG. **7**, the lid frame **110** includes an upper lid frame **120** which forms the appearance of an upper portion of the lid frame **110** and a lower lid frame **130** which forms the appearance of a lower portion of the lid frame **110** and is connected to a lower side of the upper lid frame **120**.

A plurality of lid inners **140** may be positioned to be spaced apart from each other by a predetermined interval. For purposes of brevity, it is assumed that four lid inners **140** are provided. However, the present invention is not limited thereto. For example, at least two or more lid inners **140** may be provided.

Each of the four lid inners **140** may have the similar shape to that of a corner of the lid frame **110**. Two lid inners **140** are arranged at each side of the lid frame **110**. For example, the lid inners **140** may include first, second, third, and fourth lid inners **141**, **142**, **143**, and **144**, wherein the first and third lid inners **141** and **143** may be arranged at a front side, and the second and fourth lid inners **142** and **144** may be arranged at a rear side. The hinge unit **300** may be coupled to each of the second and fourth lid inners **142** and **144**.

At least one hinge unit **300** may be provided. An embodiment will be described where the hinge unit **300** includes a first hinge unit **310** coupled to the second lid inner **142** and a second hinge unit **320** coupled to the fourth lid inner **144**. The hinge unit **300** will be described in greater detail later.

FIG. **8** is a perspective view illustrating an upper surface of the upper lid frame shown in FIG. **7**, and FIG. **9** is a perspective view illustrating a lower surface of the upper lid frame shown in FIG. **8**.

Referring to FIGS. **8** and **9**, the upper lid frame **120** has an opening at its central portion. The glass unit **150** is arranged at the opening.

The upper lid frame **120** includes a rectangular frame part **121** which has an opening at its central portion and a coupling part **122** which extends from a front end of the frame part **121** and is coupled to the lower lid frame **130**.

The coupling part **122** of the upper lid frame **120** is formed to be inclined downwards from the frame part **121** by a predetermined angle.

The decoration panel **160** is coupled to an upper side of the coupling part **122** of the upper lid frame **120**, and the lower lid frame **130** is coupled to a lower side of the coupling part **122** of the upper lid frame **120**.

Referring to FIG. **8**, the coupling part **122** of the upper lid frame **120** includes an upper connecting protrusion coupling hole **123** to which an upper connecting protrusion **161** (refer to FIG. **18**) is connected, a guide protrusion coupling hole **124** to which a guide protrusion **162** (refer to FIG. **16**) is connected, and a screw connecting hole **125** connected to the lower lid frame **130** via a connecting member, such as a screw. The upper connecting protrusion **161** and the guide protrusion **162** are formed on the decoration panel **160**. The connecting protrusion **161** and the guide protrusion **162** will be described below.

The guide protrusion **162** (refer to FIG. **16**) is inserted into the guide protrusion coupling hole **124** in upper and lower directions to guide and position the decoration panel **160** upon assembly of the decoration panel **160**. For example, the guide protrusion coupling hole **124** may be shaped to correspond to the shape of the guide protrusion **162** which will be described below.

The upper connecting protrusion **161** is inserted into the upper connecting protrusion coupling hole **123** and slides and then connected to the upper connecting protrusion coupling hole **123**. By doing so, the decoration panel **160** may slide and then is connected to the upper lid frame **120**.

The upper connecting protrusion **161** (refer to FIG. **18**) protrudes toward the upper lid frame **120** and then is bent downwards, and is thereby shaped as a hook.

The upper connecting protrusion coupling hole **123** includes an inserting part **123***a* into which the upper connecting protrusion **161** is inserted and a hooked part **123***b* which extends from the inserting part **123***a* with a reduced width in left and right directions. Accordingly, the connecting protrusion **161** may be hooked to the hooked part **123***b*.

Since the decoration panel **160** is positioned over the coupling part **122** of the upper lid frame **120**, the upper connecting protrusion coupling hole **123**, the guide protrusion coupling hole **124**, and the screw connecting hole **125** may be covered by the decoration panel **160**.

The left and right side surfaces and the rear surface of the frame part **121** may be coupled to the lower lid frame **130**. An embodiment will be described where each of the left and right side surfaces and rear surface of the frame part **121** is coupled via a connecting member, such as a screw, to the lower lid frame **130** connected with the hinge unit **300**.

The frame part **121** of the upper lid frame **120**, the hinge unit **300**, and the lid inner **140** may be integrally connected to each other by a screw. The frame part **121** of the upper lid frame **120** and the lid inner **140** may be only connected to each other by a screw. A side screw coupling hole **121***a* is formed at each of the left and right side surfaces of the frame part **121** for the screw connection. A plurality of side screw coupling holes **121***a* may be provided. The side screw coupling hole **121***a* may be positioned at a location close to the hinge unit **300**.

Referring to FIG. **9**, a rear screw coupling hole **121***b* is provided at the rear surface of the frame part **121** for screw connection. Two rear screw coupling holes **121***b* may be provided, each of which may be positioned at a location close to the hinge unit **300**. Because of being positioned at a location where the hinge unit **300** is connected, the side screw coupling hole **121***a* and the rear screw coupling hole **121***b* may effectively support the hinge unit **300**.

Each of the left and right side surfaces of the upper lid frame **120** may be connected to the lid inner **140** via a connecting member, such as a screw. The screw connecting hole **121***c* may be formed at the left and right side surfaces of the upper lid frame **120**.

Referring to FIGS. **8** and **9**, the upper lid frame **120** includes a hinge cover **127** which covers the hinge unit **300**.

The hinge cover **127** is extended downwards from each of the left and right side surfaces of the upper lid frame **120**. The hinge cover **127** has a through-hole **127***a* for the hinge shaft of the hinge unit **300** to pass therethrough.

Referring to FIG. **9**, a lid inner inserting groove **120***a* is formed at each of the left and right side surfaces of the upper lid frame **120** so that the lid inner **140** may be seated on the lid inner inserting groove **120***a*. The lid inner inserting groove **120***a* may have a cross section shaped as the symbol "[".

The upper lid frame **120** may be made of a metallic material or an elastic material. An embodiment will be described where the upper lid frame **120** is made of steel with rigidity.

FIG. **10** is an exploded perspective view illustrating lid inners and hinge units dissembled from each other, FIG. **11** is a perspective view illustrating lid inners and hinge units assembled to each other, and FIG. **12** is a perspective view illustrating a bottom surface of the lid inners shown in FIG. **11**.

As described above, the plurality of lid inners **140** include the first and third lid inners **141** and **143** positioned at a front side and the second and fourth lid inners **142** and **144** positioned at a rear side and having the hinge unit **300**.

Each of the first, second, third, and fourth lid inners **141**, **142**, **143**, and **144** is shaped as the symbol "┐"and positioned near a corner. Further, the first, second, third, and fourth lid inners **141**, **142**, **143**, and **144** are spaced apart from each other by a predetermined interval. Specifically, an end of each of the first, second, third, and fourth lid inners **141**, **142**, **143**, and **144** is spaced apart from an end of a neighboring lid inner of the first, second, third, and fourth lid inners **141**, **142**, **143**, and **144**. This prevents the lid inners from colliding with each other even when the lid inners are deformed due to heat.

The second lid inner **142** includes a first hinge unit receiving part **142***a* to which the first hinge unit **310** is inserted.

The fourth lid inner **144** includes a second hinge unit receiving part **144***a* to which the second hinge unit **320** is inserted.

Although the first and second hinge unit receiving parts **142***a* and **144***a* are described to be provided in the second and fourth lid inners **142** and **144**, the present invention is not limited thereto. For example, the first and second hinge unit receiving parts **142***a* and **144***a* may also be formed by coupling the second and fourth lid inners **142** and **144** with the lower lid frame **130**.

The first and second hinge units **310** and **320** are inserted in the axial direction into the first and second hinge unit receiving parts **142***a* and **144***a*, respectively.

The first and second hinge units **310** and **320** include hinge housings **311** and **321**, respectively, and connecting arms **312** and **322**, respectively. The hinge housings **311** and **321** are inserted to the second and fourth lid inners **142** and **144**, respectively, and wrap around the hinge shaft. The connecting arms **312** and **322** protrude from side surfaces of the hinge housings **311** and **321**, respectively, and fit into side surfaces of the second and fourth lid inners **142** and **144**, respectively.

The connecting arms **312** and **322** of the first and second hinge units **310** and **320** may be integrally connected to the lid inner **140** and the lid frame **110**, or may be connected only to the lid inner **140**.

The first and second hinge units **310** and **320** may have the same or different functions. An embodiment will be described where the first hinge unit **310** adjusts the degree of rotation of the lid assembly **100** when the lid assembly **100** is opened or closed and the second hinge unit **320** reduces the rotation speed of the lid assembly **100** when the lid assembly **100** is opened or closed to alleviate shock.

For example, the first hinge unit **310** may include a hydraulic damper filled with a fluid to adjust the rotation speed by fluid pressure.

The second hinge unit **320** includes an elastic member which provides an elastic force in the direction which opens the lid assembly **100**.

However, the present invention is not limited to the above-mentioned hinge units. The hinge unit may also include various devices or parts which may control the rotation angle or rotation speed.

Referring to FIG. **12**, a plurality of ribs are provided at a lower surface of the first, second, third, and fourth lid inners **141**, **142**, **143**, and **144**.

A glass guide rib **140***a* protrudes from a lower surface of each of the first, second, third, and fourth lid inners **141**, **142**, **143**, and **144** to seat the glass unit **150** thereon.

The glass guide rib **140***a* guides and positions the glass unit **150** upon assembly of the glass unit **150**. The protruded glass guide rib **140***a* may also be formed in the bent shape, for example, in the shape of "┐".

The first lid inner **141** and the third lid inner **143** are formed symmetrical to each other, and for purposes of brevity, the description will focus on the third lid inner **143**.

A first reinforcing rib **143***a* is formed on a lower surface of the third lid inner **143** to reinforce intensity. The first reinforcing rib **143***a* is longitudinally formed in the front and rear directions. A plurality of first reinforcing ribs **143***a* may be provided in the left and right directions and be spaced apart from each other by a predetermined interval. The first reinforcing rib **143***a* may prevent the third lid inner **143** from being deformed due to a force exerted by the glass unit **150** to the third lid inner **143** when the glass unit **150** is assembled.

An inner downward rib **143***b* protrudes downwards from a lower surface of the third lid inner **143** to be coupled to the lower lid frame **130**. A coupling hole **143***c* is also formed on the lower surface of the third lid inner **143** to be coupled to the lower lid frame **130**.

Specifically, the inner downward rib **143***b* is coupled to an inner downward rib coupling part **131***a* provided in the lower lid frame **130** as shown in FIG. **13**. The inner downward rib coupling part will be described below.

The coupling hole **143***c* is coupled to a frame rib **131***b* provided on the lower lid frame **130** as shown in FIG. **13**. The frame rib **131***b* is inserted into the coupling hole **143***c*. A protrusion **143***d* protrudes from a side surface of the coupling hole **143***c* to hook the inserted frame rib **131***b*.

A plurality of inner front protrusions **143***e* spaced apart from each other by a predetermined interval may protrude frontward from a front surface of the third lid inner. The inner front protrusion **143***e* is coupled to a front protrusion coupling rib **132***d* provided in the lower lid frame **130**. The front protrusion coupling rib **132***d* will be described below.

The second lid inner **142** and the fourth lid inner **144** may be formed symmetrical to each other. Accordingly, the description will now focus on the second lid inner **142** for purposes of brevity.

A second reinforcing rib **142***b* is formed on a lower surface of the second lid inner **142** to reinforce intensity. The second reinforcing rib **142***b* is longitudinally formed long in the front and rear directions. A plurality of second reinforcing ribs **142***b* may be provided in the left and right directions to be spaced apart from each other by a predetermined interval. The second reinforcing rib **142***b* may prevent the second lid inner **142** from being deformed due to a force exerted by the glass unit **150** to the second lid inner **142** when the glass unit **150** is assembled.

A coupling hole **142***c* is formed on a lower surface of the second lid inner **142** to be coupled to a frame rib **131***c* provided on the lower lid frame **130** as shown in FIG. **13**. The frame rib **131***b* may be inserted into the coupling hole **142***c*. A protrusion **142***d* protrudes from a side surface of the coupling hole **142***c* to hook the inserted frame rib **131***b*.

FIG. **13** is a perspective view illustrating the lower lid frame shown in FIG. **3**, and FIG. **14** is a perspective view illustrating the lower surface of the lower lid frame shown in FIG. **13**.

Referring to FIGS. **13** and **14**, the lower lid frame **130** includes a frame part **131** which opens at its central portion and a coupling part **132** which extends from a front end of the frame part **131** and is coupled to the upper lid frame **120**. The coupling part **132** of the lower lid frame **130** may be formed to be inclined from the frame part **131** by a predetermined angle. The coupling part **132** may include a locking device connecting hole **132***a* for connecting a locking device.

Referring to FIG. **13**, the coupling part **132** includes a screw connecting hole **132***b* which corresponds to the screw connecting hole **125** of the upper lid frame **120**.

A frame front rib **132***c* protrudes frontward from a lower end of the coupling part **132** to be coupled to the decoration panel **160**.

Specifically, the frame front rib **132***c* is coupled to a lower connecting protrusion **163** as shown in FIG. **16**. The lower connecting protrusion **163** will be described below.

The coupling part **132** includes a gap press-fitting part **133** which press-fittingly protrudes in the space between the two adjacent lid inners **140** and pressurizes the lid inners **140** in the direction away from each other so that the lid inners **140** may be brought in tight contact with an inner surface of the lid frame **110**.

The gap press-fitting part **133** includes a pair of ribs which protrude upwards from an upper surface of the coupling part **132** and are spaced apart from each other by a predetermined interval.

An inner downward rib coupling part **131***a* is provided on the lower lid frame **130** to be coupled to the inner downward rib **143***b*. The inner downward rib coupling part **131***a* will be described below.

A frame rib **131***b* inserted into the coupling hole **143***c* protrudes from an upper surface of the lower lid frame **130**. The frame rib **131***b* may be formed at each of left and right edges and the rear edge of the lower lid frame **130**. The frame rib **131***b* includes a protrusion hole **131***c* to which the protrusion **143***d* provided on the coupling hole **143***c* may be inserted.

The front protrusion coupling rib **132***d* is formed on an upper surface of the lower lid frame **130** to be coupled to the inner front protrusion **143***e*. The front protrusion coupling rib **132***d* includes an inserting hole to which the inner front protrusion **143***e* may be inserted in the front and rear directions.

Referring to FIG. **14**, the lower lid frame **130** forms the appearance of a lower portion of the lid assembly **100**.

The lower lid frame **130** may include a handle groove **134** which allows a user to easily hold the lid assembly. According to an embodiment, a handle which will be described below may be only used without the handle groove **134**.

A cushion part connecting hole **136** is formed on a lower surface of the lower lid frame **130** to mount a cushion part **135**.

FIG. **15** is a perspective view illustrating the decoration panel shown in FIG. **3**, FIG. **16** is a perspective view illustrating a lower surface of the decoration panel shown in FIG. **15**, FIG. **17** is a cross sectional view illustrating a combined structure of a decoration panel and a lower lid frame according to an embodiment of the present invention, and FIG. **18** is a cross sectional view illustrating a combined structure of a decoration panel and an upper lid frame according to an embodiment of the present invention.

Referring to FIG. **15**, an upper part of the decoration panel **160** is slidingly connected to the upper lid frame **120**, and a lower part thereof is connected to the lower lid frame **130**.

The decoration panel **160** may be formed to be inclined or bent downwards to correspond to a coupling part of the lower lid frame **130**.

Referring to FIGS. **16** and **18**, a lower connecting protrusion **163** is formed on a lower surface of the decoration panel **160** to be coupled to the frame front rib **132***c* of the lower lid frame **130**. The lower connecting protrusion **163** protrudes upwards from an inner lower surface of the decoration panel **160** to be inserted to the lower lid frame **130** in the upper and lower directions. Specifically, the lower connecting protrusion **163** is inserted into the connecting hole formed on the frame front rib **132***c*.

Referring to FIGS. **16** and **17**, a plurality of upper connecting protrusions **161** are formed on a lower surface of the decoration panel **160**. Each upper connecting protrusion **161** may protrude toward the upper lid frame **120** and then be bent rearwards. For example, the upper connecting protrusion **161** may be shaped as the symbol "ㄱ "The upper connecting protrusion **161** is coupled to the upper connecting protrusion coupling hole **123** formed on the coupling part **122** of the upper lid frame **120**.

A plurality of guide protrusions **162** are formed on a lower surface of the decoration panel **160**. The guide protrusion **162** is coupled to the guide protrusion coupling hole **124** formed on the coupling part **122** to guide and position the decoration panel **160** upon assembling the decoration panel **160**.

FIG. **19** is an expanded perspective view of part B shown in FIG. **3**, FIG. **20** is a perspective view illustrating the top cover shown in FIG. **3**, FIG. **21** is an expanded perspective view of part C shown in FIG. **20**, FIG. **22** is a cross sectional view as viewed in the direction of arrow A of FIG. **20**, FIG. **23** is a view illustrating a situation where the lid assembly shown in FIG. **22** is closed, FIG. **24** is a side view illustrating the lid

assembly shown in FIG. **23**, and FIG. **25** illustrates a process where a lid assembly is opened by a user's hand.

Referring to FIGS. **19** to **24**, a front end of the lid assembly **100** protrudes forwards more than the top cover **200**, thereby defining a handle **400**.

The handle **400** may be a lower portion of a combined part that a front portion of the lower lid frame **130** and a front portion of the decoration panel **160** are combined.

Referring to FIG. **23**, a front end of the lid assembly **100** is arranged to protrude forwards more than the top cover **200** by a predetermined distance (d) so that a user may easily hold the handle **400**.

Referring to FIGS. **23** to **25**, the handle **400** and the top cover **200** are spaced apart from each other in the upper and lower directions and in the left and right directions, thereby defining spaces S**1** and S**2**. The spaces S**1** and S**2** are sized to sufficiently accommodate an adult hand. The space S**1** is formed in the upper and lower directions, and the space S**2** is formed in the left and right directions.

A user's hand is sequentially inserted into the space S**1** and the space S**2** so that the user may hold the handle **400** and lift the lid assembly **100**.

The spaces S**1** and S**2** may be formed by a step part **210** provided at a front side of the top cover **200**.

Referring to FIGS. **20** to **22**, the step part **210** is formed by letting a front end of the top cover **200** spaced apart from the handle **400** by a predetermined interval. Each corner of the step part **210** may be rounded.

Referring to FIG. **22**, the step part **210** includes a first rounded portion R**1** with a predetermined curvature and a second rounded portion R**2** with a predetermined curvature. The first rounded portion R**1** faces a user's fingertip inserted to the step part **210** and is bent upwards. The second rounded portion R**2** is bent rearwards. Since each corner of the step part **210** is rounded, a user's finger or fingernail is prevented from being damaged when the user's hand is inserted to the spaces S**1** and S**2** and lifts the lid assembly **100**.

Further, a portion **212***a* where a front portion **211** of the top cover **200** and the step part **210** meet each other may also be rounded with a predetermined curvature.

Referring to FIGS. **23** and **25**, the handle **400** may be a lower portion of a combined part that the lower lid frame **130** and the decoration panel **160** are combined. The lower portion of the handle **400** may be rounded.

Referring to FIG. **24**, a thickness (t) of the lower portion of the handle **400** may be as long as a joint of adult middle finger. For example, the thickness (t) may be in a range from 15 mm to 17 mm. When the thickness (t) is set as above, user's hand may be easily inserted into the spaces S**1** and S**2**.

The lower portion of the handle **400** includes a protrusion **401** which protrudes towards the top cover **200**. The protrusion **401** is rounded so that the inserted user's fingers are hanged to the protrusion **401**, and this allows the user to easily lift the lid assembly **100**.

FIG. **25** illustrates a process where a lid assembly is opened by a user's hand.

As shown in FIG. **25**A, a user first inserts his hand in the spaces S**1** and S**2** between the lid assembly **100** and the top cover **200** when putting or pulling laundry in/out of the washing machine before/after washing. The user's fingers are first inserted in the space S**1**. In this situation, since the first rounded part R**1** is formed to be rounded, the user's fingertips or fingernails are prevented from being damaged.

As shown in FIGS. **25**B and **25**C, the user's fingers are subsequently inserted into the space S**2**. At this time, the user may lift the lid assembly **100** with the back of his/her hand contacting the second rounded part R**2**. Since the second rounded part R**2** is formed to be rounded, the user's fingertips or fingernails are prevented from being damaged.

Thereafter, the lid assembly **100** is lifted to be opened as shown in FIG. **25**D.

The invention has been explained above with reference to exemplary embodiments. It will be evident to those skilled in the art that various modifications may be made thereto without departing from the broader spirit and scope of the invention. Further, although the invention has been described in the context its implementation in particular environments and for particular applications, those skilled in the art will recognize that the present invention's usefulness is not limited thereto and that the invention can be beneficially utilized in any number of environments and implementations. The foregoing description and drawings are, accordingly, to be regarded in an illustrative rather than a restrictive sense.

What is claimed is:

1. A washing machine comprising:

a cabinet;

a top cover which is arranged at an open top surface of the cabinet and has a laundry entrance hole; and

a lid assembly which is arranged at the top cover and opens/closes the laundry entrance hole, wherein the lid assembly comprises:

an upper lid frame in which a first hole is formed;

a lower lid frame coupled to a lower side of the upper lid frame and in which a second hole is formed;

a transparent panel between the upper lid frame and lower lid frame; and

a decoration panel coupled to front sides of the upper and lower lid frames;

wherein the decoration panel comprises:

an upper connecting protrusion which is inserted into the first hole in a first direction, movement of the upper connection protrusion in a second direction, which is substantially perpendicular to the first direction, being restricted at a position where the upper connecting protrusion is inserted; and

a lower connecting protrusion which extends in the second direction and inserted into the second hole, movement of the lower connecting protrusion being restricted in the first direction.

2. The washing machine of claim **1**, wherein the decoration panel covers part of a front upper surface of the upper lid frame.

3. The washing machine of claim **2**, wherein a front portion of the upper lid frame is formed to be inclined by a predetermined angle,

wherein the decoration panel is formed to be inclined to correspond to the upper lid frame, and

wherein a front lower portion of the decoration panel is rounded.

4. The washing machine of claim **2**, wherein a lower end of the decoration panel is arranged to be lower than a front end of the lower lid frame to cover the front end of the lower lid frame.

5. The washing machine of claim **1**, wherein the upper connecting protrusion extends in the second direction from the decoration panel and then is bent in the first direction.

6. The washing machine of claim **1**, wherein the lower connecting protrusion is press-fittingly coupled with the second hole.

7. The washing machine of claim **1**, wherein the decoration panel includes a guide protrusion which protrudes towards an upper surface of the upper lid frame and guides an assembling position, and the upper lid frame includes a guide protrusion coupling hole to which the guide protrusion is coupled.

8. The washing machine of claim 1, further comprising:
a handle provided at a front side of the lid assembly and protruding forward more than the top cover;
a first space that is defined between a front portion of the top cover and the handle in the second direction, the first space configured for a user's finger to be inserted; and
a second space that is defined between a portion next to the front portion of the top cover and the handle in the first direction.

9. The washing machine of claim 8, wherein the handle is a lower portion of a combined part that a front portion of the lower lid frame and the front portion of the decoration panel are combined.

10. The washing machine of claim 8, wherein a thickness of a lower portion of the handle ranges from 15 mm to 17 mm in the first direction.

11. The washing machine of claim 8, wherein the top cover comprises:
a first rounded part formed between the first and second space with a predetermined curvature; and
a second rounded part formed at an end of the second space, the second rounded part having a curvature opposite to the first rounded part.

12. The washing machine of claim 1, wherein the decoration panel slidingly moves along a front upper surface of the upper lid frame and is inserted into the first hole.

13. The washing machine of claim 12, wherein the first hole comprises a portion which has a width narrower than the other portion of the first hole, into which the upper connecting protrusion is inserted.

14. A washing machine comprising:
a top cover having a laundry entrance hole;
a lid assembly arranged to be able to rotate at an upper side of the top cover and opens/closes the laundry entrance hole, wherein the lid assembly comprises:
an upper lid frame forming an upper portion of the lid frame;
a lower lid frame forming a lower portion of the lid frame;
a transparent panel between the upper lid frame and lower lid frame; and
a decoration panel comprising:
an upper portion which slides in a first direction and is coupled to a front upper side of the upper lid frame such that a movement in a second direction, which is substantially perpendicular to the first direction, is restricted; and
a lower portion coupled to the lower lid frame such that a movement in the first direction is restricted.

* * * * *